Computerworld

March 14, 1984
Vol. 18, No. 11A

On Communications

Special Section: Local-Area Nets

Centrex Battle

CPE Buying Spree

Rolm Profile

network and [illegible]

And it provides [illegible] networks do [illegible] be moved to a new [illegible] line already in [illegible] plicated interfacing [illegible]

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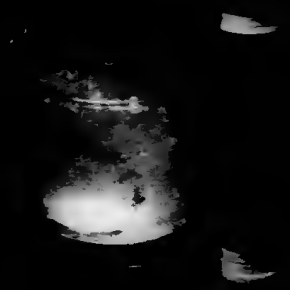
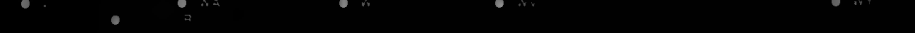
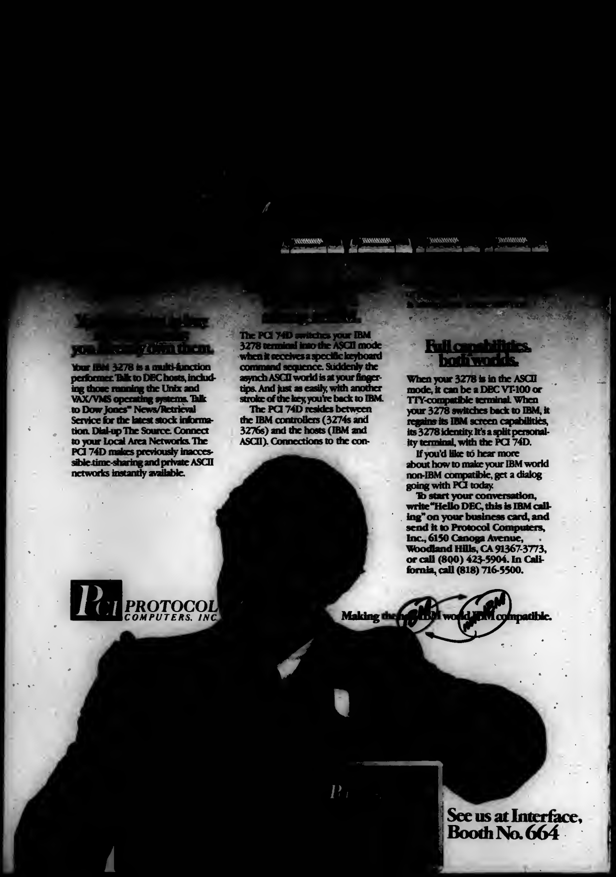




CONTENTS

DEPARTMENTS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EDITORIAL

Vanishing Videotex?

The cavalcade of new and innovative communications technology is impressive and seemingly never-ending. In the past few years, we have witnessed the introduction of local-area networks, satellite networks, digital private branch exchanges (PBX) and a host of other ground-breaking technologies.

There is a tendency to assume they are all smashing successes. However, in the case of videotex, we wonder. Videotex uses telephone lines and CRT screens to send and receive data and graphics. Its technological cousin, teletext, is a receive-only service that broadcasts over the airwaves.

Videotex has been around in its current form for a few years now. It has been the subject of international attention through many articles in both the trade and general press. The French government has been one of the most notable videotex boosters, implementing a test network around Paris as part of its nationwide *Informatique* computerization program. The French planned to give videotex terminals to all users free of charge with the expectation of making up for the losses by selling the terminals in this country. U.S. sales have not been impressive.

Here, videotex has barely gotten off the ground. Only one commercial venture is currently in operation. It is run in southern Florida by Knight-Ridder Newspapers, Inc. and AT&T. Another that is being offered by Times Mirror, Inc. is scheduled to start this July in Orange County, Calif.

Recently, IBM, CBS, Inc. and Sears, Roebuck & Co. gave the lagging technology a publicity shot in the arm by announcing a joint videotex venture *that won't begin for several years.* The politics of this are more interesting than the service itself. It looks like IBM vs. AT&T.

Over the past two years, CBS tested a videotex service with AT&T in Ridgewood, N.J., called Venture One. CBS is said to have broken off the relationship with AT&T because IBM plans to offer its service to residences with personal computers, while AT&T made Venture One available only over $600 terminals that could not be used for anything else. CBS reportedly dumped $10 million into Venture One. The key here is personal computers, or more appropriately, home computers, since the IBM-CBS-Sears service is destined for homes as opposed to businesses.

For many years, industry pundits predicted the widespread proliferation of home computers. It just hasn't happened. Ask Texas Instruments, Inc., which cancelled its home computer. Prices have been too high and applications too few.

People are slow to change their culture and habits. Bringing a computer into their homes represents a radical change, and they won't make such a change without very compelling reasons. So what if they can do shopping from home? Most people would rather go out to shop, given the choice.

The time may come when computers or some kinds of terminals are commonplace in the home. But that is not going to happen for at least another 10 years, when integrated services digital networks become universally accessible.

In the meantime, unless videotex technology can be popularized outside the home market, it will remain on the outside looking in.

Announcing . . .

I am proud to announce that *Computerworld On Communications* is increasing its frequency of publication from six to 12 times a year, effective with our June issue.

The events of 1984 have underscored the need for more information on the communications industry. The breakup of AT&T and the formation of a virtually new industry has placed an unprecedented burden on the shoulders of computer and communications professionals. There are new opportunities and new problems. There is new technology.

By going monthly, we intend to bring the changing communications picture into sharper focus for you. We will be adding a news analysis section and our departments and features will become twice as timely. It all adds up to more comprehensive coverage of the most dynamic industry in the world.

We look forward to sharing that coverage with you.

Bruce Board

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Second-class postage paid at Framingham, Mass., and additional mailing offices. *Computerworld* (ISSN-0010-4841) is published weekly, except: January (6 issues), February (6 issues), March (5 issues), April (7 issues), May (5 issues), June (6 issues), July (6 issues), August (5 issues), September (6 issues), October (6 issues), November (6 issues), and a single combined issue for the last week in December and the first week in January by CW Communications/Inc., Box 880, 375 Cochituate Road, Framingham, Mass 01701.

Computerworld subscription prices: $2.00 a copy; U.S. — $46 a year; Canada, Central & S. America — $110 a year; Europe — $165 a year; all other countries — $245 a year (air-mail service). *Computerworld On Communications* single copy price: $5.00. Four weeks notice is required for change of address. Please allow six weeks for new subscription service to begin.

Computerworld can be purchased on 35mm microfilm through University Microfilm Inc., Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich 48106. Phone: (313) 761-4700. *Computerworld* is indexed. Write to Circulation Dept. for subscription information.

POSTMASTER: Send Form 3579 (Change of Address) to Computerworld Circulation Dept., Box 880, 375 Cochituate Road, Framingham, Mass. 01701.

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PRO & CON

Clamping the Cuffs on Centrex?

The furor over the Federal Communications Commission's (FCC) proposed access charges for Centrex users has galvanized the interest of two sharply divided groups. The first group is comprised of the Bell operating companies that offer Centrex, a central office-based competitor to private branch exchanges (PBX). The second group is the North American Telecommunications Association (Nata), which represents PBX and other equipment manufacturers.

Last July 27, the FCC proposed that a $2 maximum access charge be levied on each Centrex line purchased before that date and a $6 maximum charge be placed on lines acquired after it. The FCC reaffirmed its commitment to that scheme in early February.

Nata sees that policy as a bailout for Centrex, while the operating companies feel it will give PBX users an unfair advantage and drive the operating companies into financial ruin.

In this month's "Pro and Con," we present the opinions of both sides.

PRO

By Edwin B. Spievack

While the questions surrounding the determination of equitable access charges for Centrex users appear complex, the central issue is quite simple. Should access charges for large corporate and institutional users of Centrex service — which competes directly with private branch exchange (PBX) products offered by competitive equipment suppliers — be subsidized at the expense of all non-Centrex ratepayers, competitive PBX and Key system suppliers and continued technological innovation?

The thrust of the Federal Communications Commission's (FCC) initial access charge decision, announced in December 1982, was reasonable: "Users of the local telephone network should be responsible for the costs they actually cause." Essentially, charges were divided into two categories: traffic-sensitive costs, whereby customers would pay according to their actual use of the network, as they do now; and nontraffic-sensitive costs, whereby all users — business and residential — would pay flat rates to recover the basic costs of maintaining the wire or trunk line between the customer's premises and the central office switch. The nontraffic-sensitive rates have stimulated the controversy between Centrex and PBX users and suppliers, not to mention the related outcry by residential customers.

Phase 1 of the protectionism campaign culminated in July 1983, when the FCC proposed a major bailout to the Bell operating companies. Their existing or "grandfathered" Centrex users would pay only $2 per month in nontraffic-sensitive trunk line charges, compared with $6 per month for all other multiline users, including customers who signed up for Centrex after July 27, 1984. Incredibly, the cut-rate treatment for Centrex users — big business, big government and large institutions — was the same afforded residential customers. The decision — on its face, arbitrary and capricious — has been appealed to the courts by the North American Telecommunications Association (Nata).

Predictably, however, the Bell operating companies said the generous July Centrex bailout provided insufficient protection. A hypothetical example illustrates why. Let's say a PBX user has 100 telephones in his office. Because so much of his traffic is handled internally by the on-premises PBX switch, he might need only 10 truck line connections to the central office. At $6 per line, his monthly access charge payments would be $60.

A similar office with 100 telephones, but with Centrex, would require 100 trunk connections.

(Continued on Page 5)

Spievack is president and executive director of Nata, Washington D.C.

CON

By Jim Epperson

Unnecessary expenses. Fewer choices. More uncertainty in the telecommunications industry. Higher local rates.

These and other hardships could become reality if the Federal Communications Commission (FCC) does not permit fair pricing policies for Centrex-CO services. The issue at hand is the discrepancy between how access charges will apply to private branch exchange (PBX) systems and Centrex-CO lines.

Southwestern Bell Telephone Co., other Bell operating companies and many business organizations believe that the FCC could provide an equitable solution by applying the same set of pricing rules to both PBX and Centrex service. A closer examination reveals that much is at stake.

Under the current FCC plan, the Centrex customer would pay far more than a customer served by a comparable PBX — even though the systems provide equivalent service. Here is an example, comparing a Centrex system serving 1,000 stations with a PBX of the same size. The Centrex system would have 1,000 loops or lines connecting the customer's business to the telephone switching office. The PBX would typically have 89 trunks for exchange access. An existing Centrex customer would pay $24,000 annually in interstate access charges. The PBX customer would pay about $6,400 — again for comparable service. A new Centrex customer, defined by the FCC as one who ordered the service after July 27, 1983, would be charged $72,000 based on the commission's current order.

There would be an unfortunate result of this discriminatory policy. Many current Centrex customers would be forced to incur the unnecessary expense of changing their telecommunications system, not because Centrex no longer meets their needs, but because they could not afford higher rates imposed by the FCC.

As existing Centrex customers abandon the service, Southwestern Bell would be burdened with a substantial amount of idled plant for some time. Even though the plant would not be used, and therefore would not be producing revenue, it would remain an earnings requirement to be borne by the general body of ratepayers.

As a result, other customers would be forced to shoulder this unnecessary expense — estimated to be about $9 per year for remaining access lines.

Because the higher business end-user access charge would apply to all new Centrex systems, it is likely that potential customers would find the service economically unfeasible. This is unfortunate, because existing outside plant and central office capability — which could have been used by new Centrex customers — would instead become an additional burden to ratepayers.

The FCC's approach would effectively reduce the number of options available to customers, as well as add yet another element of uncertainty to the telecommunications industry.

What is the solution? Centrex customers should pay end-user access charges commensurate with PBX customers of comparable size. This could be accomplished by applying a PBX trunk equivalency ratio. To determine the appropriate ratio, existing or proposed Centrex systems could be examined to see how many trunks would be required if the customer were served by a PBX based on industry trunk equivalency studies. Access charges would be applied accordingly.

Some parties have wrongfully argued that end-user access charges should be applied to all Centrex lines because, like regular business and residential lines, they are connected directly to the telephone switching office. But there is a substantial difference.

(Continued on Page 5)

Epperson is staff manager, corporate news, Southwestern Bell, St. Louis, Mo.

PRO

(Continued from Page 4)
Even at the bargain-basement rate of $2 per line, the Centrex user's monthly payments would be $200. What the Bell operating companies want is the total elimination of Centrex access charges or a skewed parity formula that gives Centrex service a preferential pricing advantage over competitive equipment suppliers.

Thus, Phase 2 of the Centrex bailout was launched, and it incorporated three equally spurious arguments. First, the Bell operating companies, accompanied by Fortune 500 corporations still using Centrex, introduced the concept of PBX trunking equivalencies. Stripped of its "scientific" veneer, the concept is simple:. If our hypothetical PBX user with 100 telephones and 10 trunk lines pays $60 a month in access charges, then our hypothetical Centrex user with 100 telephones should also pay $60, despite the reality that he requires 10 times as many lines.

Second, the Bell operating companies argued that because Centrex customers often use their lines for nonbasic exchange calls, they should be assessed less. Their argument conveniently evades the basic point of the FCC decision: access charges to cover the nontraffic-sensitive costs of network maintenance have nothing to do with how or how often the lines are used.

Finally, the Bell operating companies, with some support of state regulators, have raised the threat that without further protection, users will continue to abandon Centrex and saddle the telephone companies with stranded investment in central office plant. The claim is untrue. Testimony from telephone company executives in several state proceedings indicates that the utilities could reuse all but 10% to 30% of their outside wires and probably all central office equipment now devoted to Centrex for the provision of basic local exchange service.

Who will suffer from a Centrex bailout?

■ *All PBX and Key system users.* They will be discriminated against by having to pay higher access charges.

■ *All PBX and Key system suppliers.* They will be forced to compete against the Bell operating companies' underpriced, subsidized Centrex service.

■ *All residential and business ratepayers.* They will be forced to make up the shortfall in Centrex access charges through higher long-distance bills. Someone must pay for the network.

■ *Technological innovation.* PBX technology was developed to satisfy market needs not met by Centrex, its predecessor. A bailout of Centrex rewards outmoded, inefficient technology and penalizes modem, more efficient alternatives.

■ *Competitive policy.* A Centrex bailout contradicts the thrust of the FCC's deregulation policy, the AT&T antitrust settlement and recent legislative proposals.

Compared with the multitude of losers, there are only two beneficiaries of a Centrex bailout: a small class of corporate and institutional users and the Bell operating companies. The choice is clear: protectionism or the public interest? ■

CON

(Continued from Page 4)
Business and residential access lines are used exclusively to access the local and long-distance networks.

On the other hand, a considerable amount of traffic on Centrex systems never reaches the public network — instead it stays in the system in the form of intercom calls. The bottom line is that Centrex and PBX systems provide equivalent exchange service. In fairness, then, equivalent pricing rules should apply.

Southwestern Bell has formally asked the FCC to reconsider its position regarding the imposition of access charges on Centrex-CO lines and to adopt the PBX equivalency ratio. The FCC's most recent decision reaffirms its earlier position. There is no doubt that reaffirmation will have a substantial impact on Centrex users, Southwestern Bell and, equally important, all the company's customers. It is crucial that the FCC modify its ruling so all customers will be treated fairly. ■

DIALOGUE

Do you foresee a conflict between communications and DP managers?

Howard Frank, president, Contel Information Systems, Inc., Great Neck, N.Y.:

"I see more than just a conflict. I see a battle that I believe will be won by the DP people and will end up absorbing the communications functions as part of DP.

"The reason is based on two indisputable facts. Look at the DP organization today, and you see a much larger staff than the corresponding communications organization. Second, examine the level of reporting as compared to communications, and you will find the head of the DP organization reports in at a much higher level. He may be a vice-president or he may be a director, but he is always at a higher level of the corporate hierarchy than his communications counterpart.

"In the '70s, communications was an uncontrollable cost expense that required little management. Correspondingly, the communications manager was an order-taker who worked between the end user in the organization and the telephone company. As such, he did not need to be so high up in the organization. The reality has profligated itself. Communications has grown in stature, but not to the level of the DP department, which grew up as long ago as the '60s."

Former telecommunications manager, currently telephone systems manager of a supermarket chain:

"I've been in communications for 25 years. We veterans feel we have been doing telecommunications for so long that we know our way is the best way.

"I even dropped out of the [Telecommunications Association] because I felt I was getting very little value out of it. You see, in many companies, the people in the communications area are pretty new in the industry. They were just seeking information from TCA. So we decided it wasn't worth our time to participate.

"There is a definite split between data communications and voice communications. There are different networks for the two types of systems. Eventually, it will have to be brought under one person, one head. [Private branch exchanges] exist, and they handle both data and voice. We are going in the wrong direction. The two jobs should be merged, not split.

"As I see it, DP people want to get more involved in communications, because it is the new frontier, just as DP was years back. There will definitely be a conflict. DP people might be trying to take over communications or responsibility for a larger portion of it. It is a trend I'm aware of. Actually, it is a trend I have seen. It has changed, but not for the better."

Shaun Delany, telecommunications and planning analyst, H.J. Heinz Co., Pittsburgh, Pa.:

"When I came here six years ago, communications was an add-on to office services. Now it has been folded into the communications systems department. It has tremendous visibility and responsibility now.

"Telecommunications is getting so much publicity, and its value has been heightened so much in the past 10 or 15 years — the way you deal with the telephone company and the skills needed are so much more. It's the thing to get into. It is corporate visibility.

"All I can say is communications people have not effectively sold upper management on the importance of communications. The telecommunications person who loses and finds himself in effect reporting to data processing has not done an effective job of communicating what he is doing.

"I do not see any conflicts in my environment in particular. I think those conflicts existed in the past. It depends on the company and who the communications people report to. It is clear that computers and communications are merging. The PBX Heinz just put in is a microprocessor.

"At Heinz, both computing and communications report to the same general manager. I work full-time on communications planning and activities, and another fellow works more on day-to-day operatons. I work with DP people when necessary.

Larry Abearn, manager of technical services at Harper & Row Publishers, Inc., New York:

"That is tough for me to answer because at our company, the DP people are the communications people.

"I don't see any real conflict because we separate communications into voice and data. Data communications is handled mostly by data processing people here. The people on the voice side are

responsible for the telephone system, taking care of the economics of it and so on. I don't see it as a conflict. There might be a conflict for companies where data communications was separate from data processing, but not at this company.

"In my department, technical services, we handle the data communications side of things, such as modems. We are the ones who take care of line problems and response time problems. We are involved with hooking up personal computers to the host and installing protocol conversions.

"We do not have anything to do with the telephone system itself. We are a multilocation company, and we have various PBX systems installed in different places.

"Data processing never had anything to do with the PBX, until recently. Now, they are being asked to start to study those things and learn more about them and see how they tie together. What we've been doing with voice and data communications is somehow going to merge. The PBXs are so capable of handling data transmission that we see ourselves getting involved in that area. There are no definite plans to merge, but it will happen."

Francis X. Dzubeck, president, Communications Network Architects, Inc., Washington, D.C.:

"In most major organizations, there will not be a conflict because communications and data processing people are coexisting in the same functions and, in all probability, they report to a common managerial function.

"There is a major conflict occurring in organizations where this does not occur, and those organizations are going through the throes of that conflict. The impetus is the co-mingling of voice and data.

"In large corporations that are forward-thinking, they are integrating the responsibility functions of voice and data."

John Malone, president, Eastern Management Group, Parsippany, N.J.:

"If you had asked me that question 18 months ago, I would have said that I see a very real conflict establishing itself between the communications manager and the DP manager, as each jockeyed for control of the [management information systems] function within the companies they worked for.

"But what we have found over the last 18 months in the research we do is that both groups understand that as the technologies they are responsible for converge, there is a definite requirement for individuals who clearly understand their own discipline, yet have an appreciation for their counterparts.

"Therefore, as I look at the next five years, I do not feel the relationship between the communications manager and DP managers will be adversary, nor that either of these parties view the future of the relationship as being threatening.

"I think the way they tend to view it is that voice, image, text and data will converge. However, there will clearly be a requirement for the expertise of data communications managers to address some of these specific piece parts such as the requirement for the communications manager to understand the role of the PBX switch and how it fits into the role of the entire communications environment."

LETTERS

Hysterical Harry

The article was fantastic.
Best wishes.

Harry Newton
Publisher
Teleconnect
New York, N.Y.

Congratulations on the January issue of *Computerworld On Communications*. You certainly are getting an excellent variety in coverage and depth of the articles.

Harry Newton's picture on the cover led me to conclude you had sold him the inside page to advertise *Teleconnect*, but then I understood: Harry had sold you. He certainly brings an almost irreverent view to the industry, but never irrelevant. His knack of reinforcing the role and sophistication of the end user is a great contribution to the emerging infrastructure of the business.

Desmond F. Hudson
President
Northern Telecom, Inc.
Nashville, Tenn.

Please send information about how I can contact Harry Newton and his Telecom Library. You article has really aroused my interest.

Jim Greig
Olympic Business Computers
Bellevue, Wash.

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KATHERINE HAFNER

Rolm Wasn't Bought in a Day

The courtship between **IBM** and **Rolm Corp.**, heading for full bloom, is providing much fodder for the troughs of industry speculators and journalists alike. Ever since Big Blue's unconsummated connection with Mitel Corp., the whole world has been watching the IBM-Rolm liaison with bated breath. IBM's share in Rolm was 20% at press time, up 5% since the initial acquisition last June. And IBM watchers fully expect IBM to buy the maximum 30% allowable by the end of 1984.

As a leading manufacturer of private branch exchanges (PBX) in Europe since 1971, IBM has been considering a move into the U.S. PBX market for the past decade. Its brief encounter with Mitel ended when Mitel could not deliver its software on time. So IBM cast about for another relationship and anchored itself with Rolm. Now that IBM is pretty well ensconced in its new relationship, everyone is buzzing with conjecture about the course the two plan to take.

"In broad terms, IBM plans to integrate Rolm into its [office automation] plans," said Kenneth Bosomworth, president of International Resource Development, Inc. "At a strategic level, IBM's interest is to have a particular version of a PBX around which it can construct network elements of OA strategies."

Translated into actual products, IBM's local-area net offering and micro-to-mainframe communications will integrate Rolm switches, Bosomworth speculated.

In order to maintain account control, one IBM pundit said, Big Blue has no choice but to include a switch in its offerings. "Technology is forcing IBM to do things it probably hadn't planned to do," said William A. Morgan of TelePC Consulting. Morgan sees the coexistence of broadband networks and PBXs as the optimum networking solution for the future.

Depending on whom you listen to, IBM is either in this for the switch or for the research and development expertise available at Rolm. "I think IBM's involvement is primarily for market research rather than for something it is planning to market," Phil Reagan, a California consultant, suggested. "IBM does say it's an investment. What they don't say is that it is an investment in research and development."

IBM, of course, offers little light to shed on the matter. "As a practice, we don't really discuss plans," said one IBM spokesman.

On Communications staff writer Hafner collects tidbits of communications news for "At Large." She welcomes suggestions.

"It's not a cut and dry situation," said a second.

And the following was offered by a third corporate communications specialist: "We intend to negotiate specific agreements providing for cooperative development efforts and possible joint ventures outside the U.S."

AT&T Information System's long-awaited Net 1000 service has confounded the communications community to the point where speculation is something of a joke. The value-added net is described by AT&T Information Systems public relations people as a "shared, distributed, customer-programmable intelligent data communications network alternative" to such plain-vanillas as GTE Telenet and Tymnet, Inc.

But industry analysts and beta testers appear to be decidedly unimpressed by what they have seen to date. "Net 1000 seems to be pretty much plain vanilla, too," Alysa Subtelny, a market analyst at The Yankee Group, said. "Or if it's got sprinkles, they're the same sprinkles everyone else has."

Net 1000 has already died many deaths since its first incarnation in 1975 as Bell Data Network, which was scrapped and then replaced in 1978 by Advanced Communication Service — nicknamed "Almost Communication Service" by some of its early detractors. In 1981, AT&T scuttled the system yet again, and when American Bell, Inc. was formed in June 1982, the network resurfaced as Net 1. The name Net 1 was short-lived, as Ungermann-Bass, Inc. had already claimed that for its local-area network. Thus, Net 1000 was born.

Net 1000's identity crises have been compounded by the suspicion among analysts that the product is having difficulty finding a comfortable user niche among its two dozen beta testers.

Gary Schultz of Northwest Industries in Chicago, which tested Net 1000 for two months last spring, seemed to confirm that suspicion. "Our needs for the network were limited," he said. "We wanted strictly data transport services. American Bell kept saying, 'We're not in the transport business.' In fact, they said that so often the words still ring in my ears. But when you logged on to the network, it was clear you were logging on to a time-sharing system. When you got your bill, you knew you were billed according to how much processing time you used."

Schultz branded the network "a bit of an overkill." He explained, "We wanted a simple method for communicating and transporting data. The price was higher than what we wanted to pay.

"Net 1000 certainly has potential," he said. "But the direction they were going with it seemed to be at a 45-degree angle."

Undeniably, progress has been made. Net 1000 was demonstrated live for the first time at the recent Communications Networks exposition in Washington, D.C. At the same time, AT&T Information Systems announced a third-party software agreement with AGS Computers, Inc., whereby the Mountainside, N.J. company will develop customized software for users to "sign up electronically" for the Dow Jones & Co., Inc.'s News/Retrieval via Net 1000.

In 1981, the FCC gave AT&T approval to spend up to $500 million developing Net 1000. According to Allen Rehert, director of Net 1000 product support at AT&T Information Systems, while capital spending on the network to date is well below that ceiling, Net 1000 will still "take some time to implement." With phased implementation, Rehert said, the system will be up and running by the third quarter of 1984.

If AT&T Information Systems is going to gain an edge on the marketplace, that edge will be obtained by dint of AT&T's reputation for reliable service and technical support. "We were immensely pleased with the support we got," Schultz pointed out. "Their technical support is the best we've had in a long time."

Subtelny echoed these sentiments. "From the feedback we've gotten, even from the test sites that felt Net 1000 wasn't right for them, people across the board were very pleased with the support they got from AT&T. It was like in the good old days with IBM, when IBM camped out with your system if anything went wrong."

Other field testers for the network are Transamerica Corp., Roadway Express, Inc. and Ford Motor Co. Transamerica has reportedly had extensive problems with the product: "The issue there was one of deployment," Rehert insisted. Ford's beta test began in February, so a full evaluation of the system is yet to be made.

According to Robert Everhart, Ford's project manager for data communications planning, Net 1000 will be used for an experimental "parts locater" system, whereby a dealer can inquire about the status of another dealer's inventory.

Ford was seriously considering Tymnet for the same inquiry system, but decided on AT&T Information Systems. "We wanted to give them an opportunity to see what they could do with this," Everhart said.

Ford's 90-day agreement with AT&T Information Systems is just for the pilot test, for which AT&T Information Systems is developing the software to run on the network. At the end of the 90 days, Ford will decide whether to expand the system nationwide or discontinue it entirely.

At this early stage, Everhart said he is pleased with the support he has seen from AT&T Information Systems. "But the proof of the pudding will be when the test gets under way, and we see how well it works," he added. ■

ALAN PEARCE

When Weaning Turns to Warring

A traditional and historical alliance will come to a crashing and competitive end this year.

For over a hundred years, AT&T and the Bell operating companies have worked together to give the nation rapid, efficient and low-cost telephone service. They have never competed head to head. Even when U.S. Federal District Court Judge Harold Greene approved the divestiture of the Bell operating companies in settling the antitrust case, there were few who saw that the breakup of the company would result in inevitable competition among its parts.

But it is now becoming clear that the divested Bell operating companies are ready to enter the inter-Local Access and Transport Area (Lata) toll market, while AT&T is preparing to become the major local telephone bypasser. In addition, the two former allies are already competing in the customer premises equipment field — a rivalry that will become more intense as the year progresses. Finally, both AT&T and the operating companies want to amend the Federal Communications Commission's (FCC) 1980 Computer II decision.

CHARLES RODRIGUEZ

It is perhaps ironic that the biggest threat to the future of AT&T's competitive prospects in the long-distance telephone market is from its newly divested operating companies. The regional holding companies are determined to set aside the business restrictions that prevent them from competing with their former parent in long-distance telecommunications — the inter-Lata market.

Under the terms of the Modified Final Judgment, which settled the antitrust case, the local operating and regional holding companies can provide only exchange access and local service functions.

They may not provide any other service that "is not a natural monopoly service actually regulated by tariff," according to the Modified Final Judgment.

If these restrictions were set aside this year or next, the Bell operating companies would be able to compete much more effectively with AT&T Communications and carriers such as MCI Communications Corp., GTE Sprint, Western Union, Satellite Business Systems and others. Indeed, the fact that GTE was given permission to take over Sprint gave rise to the Bell operating companies' expectations and intentions regarding their reentry into the toll market.

A regional operating company such as Ameritech, which combines the midwestern Bell operating companies, might want to buy a regional toll carrier and reseller, for example Lexitel. Lexitel would be an ideal purchase for Ameritech, and it may be that the regional carrier, based in Detroit, will need some capital, which Ameritech could provide, in order to expand its network.

The Bell operating companies may benefit from growing sympathy coming from Capitol Hill. Judge Greene is known to pay close attention to Congress, and any heavy political support for the Bell operating companies reentering the toll market might influence him. Clearly, if Ameritech purchased Lexitel, Lexitel would have to operate as a separate subsidiary, just like Sprint operates as a separate subsidiary in the GTE corporate structure.

Thus, we see a situation in which other telephone operating companies such as GTE can become toll carriers, while the divested Bell operating companies cannot. This, it will be argued, is unfair. The state regulatory commissions appear to be allies for the Bell operating companies' entry into inter-Lata toll, especially if there is a belief that their reentry into the toll market would help keep local rates down.

For its part, AT&T will not sit idly by without any competitive response. It believes that there are no restrictions preventing AT&T Communications from constructing its own local bypass facilities. Indeed, the newly reorganized AT&T sees that it is perhaps the only company with the technological and financial means to provide a nationwide web of local bypass facilities.

For the most part, AT&T's competitors are financially strapped and will focus on expanding their interexchange networks rather than on constructing local bypass facilities. However, the competitors may attempt to strike deals with existing bypassers, for example cable companies, which are also financially strapped.

Those who have studied local bypass technologies and the capital required to construct them have decided that the wise course for now is to stand back and see what the local telephone companies and AT&T Communications decide to do. After all, the Bell operating companies and AT&T, in competition with each other locally, might be able to provide much less expensive and more efficient bypass options than those constructed by others.

In addition, the Fortune 100 companies have many uses for capital other than building transmission facilities that may prove to be uneconomic if they are provided at lower cost by AT&T and the Bell operating companies. In addition, most of the big companies lack the skills necessary to manage complex telecommunications networks. This is a short-term problem, but a problem nonetheless.

Therefore, it appears that only AT&T Communications and the Bell operating companies will be in the construction of bypass facilities business, at least on a big enough scale to accomodate the short-term needs of major users.

This year will certainly see further modifications to the FCC's Computer II Decision, which was made in 1980 and became effective on Jan. 1, 1983. Both AT&T and Bell operating company lobbyists in Washington, D.C., are saying that Computer II is irrelevant after divestiture. There is growing sympathy for that view among senior staffers and some commissioners at the FCC.

Computer II requires that AT&T Communications and AT&T Information Systems build duplicate facilities in order to offer regulated and nonregulated telecommunications services. This does not make business or economic sense, but it was demanded by the FCC in 1980 in order to allow competition to develop. AT&T is now arguing that the breakup of the company renders Computer II's restrictions on AT&T's operating flexibility an unfair competitive burden. As a result, there is a good prospect that AT&T may be relieved of some of the restrictions placed on it under the terms of Computer II.

The Bell operating companies also want to amend Computer II in two areas: customer premises equipment and the offering of enhanced telecommunications services. Under the terms of Computer II, the Bell operating companies can offer customer premises equipment only via a separate subsidiary. The separate subsidiary restrictions, the Bell operating companies claim, add unnecessary costs, cause customer confusion and restrict the Bell operating companies' flexibility.

Furthermore, Computer II and the Modified Final Judgment appear to prevent the Bell operating companies from offering enhanced telecommunications services on a deregulated, detariffed basis, even if a separate subsidiary is formed. Therefore, the Bell operating companies will seek clarification from the FCC regarding whether or not they can provide enhanced services and, if so, under what regulatory or deregulatory conditions. Judge Greene may also be involved.

The two former allies are going to find themselves locked in competitive battles in toll markets, local telephone bypass, customer premises equipment and enhanced telecommunications services. The fact that AT&T and the Bell operating companies have the financial and technical resources to compete vigorously in these markets may have a chilling effect on potential competitors.

Nonetheless, the operating flexibility of both AT&T and the Bell operating companies will be determined by the FCC, the courts, the U.S. Congress and the state regulatory authorities. ■

Pearce, a regular contributor to On Communications, *is president of Information Age Economics, Inc., Washington, D.C.*

THE NON-INTEGRATION OF VOICE AND DATA

BY PATTI HARTIGAN

narrow. Until just recently, a voice manager consisted of person who looked at the phone bills to make sure that 400 clerks weren't making long-distance calls to their mothers. A clerk could do the job.

The Lanes are two of the many voice communications and data processing managers that are confronting each other face to face. As voice and data merge, it is becoming more and more complicated — and more and more crucial — to manage the two functions effectively. When the two functions are separate, problems of redundancy, incompatibility and cost-effectiveness arise. A firm may be supporting two networks when one network would suffice.

Such excess can and should be trimmed off the corporate budget, but in order to do so, data processing and communications people must work together, perhaps even be consolidated into one department.

But what happens when two previously separate functions are forced to grow closer together? Is there a race to see who calls the shots? Do they repel each other like oil and water? Does one function reign, making the other obsolete?

Surprisingly, many consultants contend that there is no conflict, that the problem was solved years ago when digital switches were first introduced. George Colony, president of Forrester Research, Inc., a Boston-based consulting firm, said he conducted a survey of Fortune 500 companies. "Typically, I saw telecommunications coming under DP control," Colony explained.

"I also saw the emergence of Swat teams, consisting of the DP manager, the telecommunications manager, the [management information systems] manager and the vice-president of finance or administration," Colony continued. These committees plan and coordinate purchasing, eliminating the problem of network redundancy and planning for future growth.

But what happens when you move out of the boardroom and into operations? The problem, it turns out, is a bit too complex to be solved by a committee.

I've never been fond of committees. It's like putting a Democrat and a Republican in the same office and telling them to solve our economic problems. They may have the same goal in mind, but their methods are going to be totally different.

John Lane

For now, a committee can be effective in determining priorities and objectives. But in terms of management, I don't think you can have two separate entities managing one collective item. You would have infighting all the time.

Judith Lane

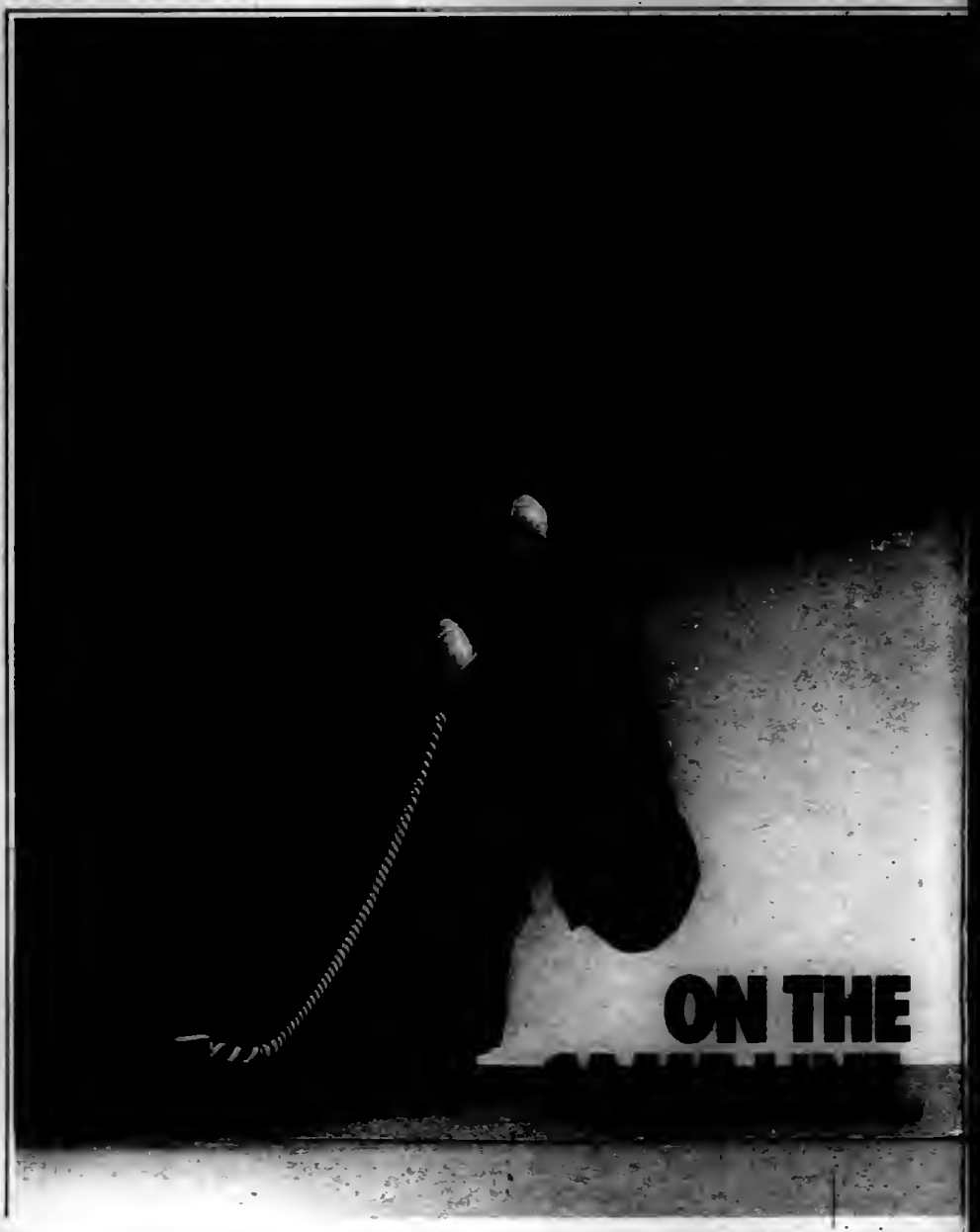
A committee would not have solved the conflict that arose several years ago at a high-tech firm with offices scattered throughout eastern Massachusetts. According to the company's former voice communications manager, voice and data were separate functions, with voice part of corporate services, which was in turn, part of administration. Data was part of information resources, which housed the DP shop. In 1979, the voice communications department set up a microwave network to bypass the local telephone company.

According to the former voice manager, who wished to remain anonymous, relations between the two departments were far from tranquil. "We tried to talk the MIS people into using the microwave network, but we were put off. They feared we were going to take over because we controlled the transmisson," he said. The data people did not begin to use the microwave network until 1982. "Things boiled down to a political situation," he remembered. "People weren't considering the corporation; they were considering their own political well-being."

SO, THE PEOPLE IN voice communications decided to "fight a war," in the words of the former voice manager. This war centered on territorial issues and on who could do a better job managing the communications function. "In addition to having a sophisticated shop, the voice people were also in charge of the data communications budget. And the data people were not very good at planning, didn't understand the technology," he explained.

"We considered the DPers to be wasting a lot of money, which may or may not have been a legitimate complaint, but that was how we perceived it. They weren't as user-oriented as we were. When things were happening, they did not respond in a fashion that we thought appropriate. So in order to protect ourselves and the corporate interest, we had to take over that responibility."

This, needless to say, did not go over big in the data department. "They resented that we had control of their budget and bashed them over the head every time they did something we didn't



agree with," the manager explained. "If we asked for an explanation, they didn't feel it was required for them to explain."

But as in any war, there was a price to be paid. "We won the war, but we lost the peace," he said. Data was finally introduced into the microwave network, but in addition, voice communications was absorbed into the MIS department. "It would have been all right if we simply got integrated with data communications. But we had to report to data processing people who really do not understand communications whatsoever and who made a lot of bad judgment errors."

As a result, there were casualties on both sides. "There was a lot of attrition on the data side," he explained, "and I left in 1982."

The problem, however, did not simply involve control, but also involved a lack of understanding between the two departments. "The most unfortunate thing was that the people we were given to in data processing did not appreciate us, nor did they understand what the hell we were doing," he added.

According to the former voice manager, this problem is not unique to his former firm. "Many DP shops are extremely conservative," he explained. "A lot of them are low risk takers. These days in communications, there is no such thing as no risk. Everything is risky. If you take no risks, you will sink in place. In order to stay above water, you've got to take risks. Many DP shops are not used to that," he explained.

Two crucial issues arose at the firm described above. "We fought two wars," the former manager explained. "The first involved who takes over — the communications people or the DPers. The second war involves where in the organization the merged function will fall — under communications or management information systems."

The first war — who will lead the merged functions — tends to be territorial. Clearly, both sides agree that the leader must have a working knowledge of both functions. However, they disagree about where that leader will come from. Both sides take a chauvinistic stance, each defending his own discipline as the best breeding ground for the leader of the merged functions.

A good data manager would probably be able to learn voice communications concepts in a fairly short period of time. I do not believe that that is true of the voice people that I have met.

John Lane

You find people in voice more amenable to learning data. Data is easier to learn because it it more highly structured.

Judith Lane

Although the Lanes were interviewed separately, their reasons for defending their respective disciplines tend to be mirror images, with each one claiming the same advantages and criticizing the other for the same disadvantages. Each partner in the marriage tends to cling to the idea that his discipline is more sophisticated than the other, that it is harder to learn.

Firmly entrenched in his or her own discipline, both managers take pride in what they do. It took them years to acquire their knowledge, and they do not think just anyone off the street, or from another department, could pick up this knowledge in a short period of time. They do not necessarily have a mutual disrespect for the other side, but more a firm respect for their own discipline, exaggerated by the possibility that their specialty may receive the short end of the stick when the two functions merge.

In addition, in the post-AT&T divestiture environment, there is a wider array of options than ever before and an encyclopedia of tariffs to consider. And both data processing and voice communications managers claim that they have more experience with handling these issues.

Most data managers have had to buy leased lines, to deal with direct-dial charges and make decisions about whether it is cheaper to dial direct, to buy a leased line or to go microwave. Until just recently, I don't think any "communications manager" on the voice side had that many options.

John Lane

The voice manager has so much more to consider than the data manager. He has to watch out for traffic and cable problems, worry about the equipment on the switch. He has to understand grade of service, to queue or not to queue, how to distribute calls, decide on the kind of transmission facilities, how to route those calls and so much more.

Judith Lane

The Lanes could argue at length about which technology is more sophisticated, which discipline breeds a better manager for the merged function. But at some firms, the problems of the "first war"— who will lead the merged functions — can be avoided, without two bruised egos struggling to gain control of the merged functions. For example, at Kaiser Permanente, a health maintenance organization based in southern California, the problem between communications and data processing was strictly organizational. And the "second war,"

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where in the organization the merged function will fall, was solved without a battle.

Until just recently, voice communications was under facilities design and construction at Kaiser Permanente. "It just so happened that the way this organization was structured for years, the major role of communications was in support of our billion-dollar building program," Joseph Bedard, the health firm's communications manager, explained. "We build a considerable number of medical centers and clinics, so the real role of communications in the past focused on building needs.

"Today with the integration of voice and data, that role is changing," he pointed out.

The voice network has always been dominant at Kaiser Permanente, but there has been substantial growth in the data network over the past few years, according to Tom Fleshman, the firm's director of information systems, which traditionally housed DP. "The two areas were not in direct confict, but they were not always talking to each other," Fleshman explained.

"Each side went along and did its own thing, until it got to a point where the two could no longer coexist without a joint focus and integration," he added.

In November 1983, voice communications was absorbed under information systems, and as yet, no problems have arisen. Asked if he felt any tension about the move, Bedard answered with a simple, "No, none at all."

Fleshman agreed. "As far as I can tell, there is no tension," he said. "In fact, I have been told by the communications manager and others that this was a positive move for them, that it provided them with a broader career path," the information systems director said.

The same solution, however, might not prove as smooth at another organization. "I have been here 4½ years, and there has never been any problem between the voice and data people," Fleshman pointed out. "That is not what precipitated this; that is not the issue at all.

"In other companies, if there is an all-out war, the same type of solution might not work," he explained.

"It depends on a lot of things: the nature of the business that the organization is in, to what extent communications plays a role and what type of role it plays.

"For example, for us, no matter how large our data network gets, voice will always be dominant. It is the key access into our system. Our patients' main entrance is via phone to make appointments, talk to doctors and so on. We run something like 23,000 voice lines," Fleshman said.

"If another company were to look at us and say 'Gee, should we put it all under DP?' — I don't know. It depends on the people involved, the comfort level of management, the track record and so on, rather than the turf issues of who it should report to and so on," Fleshman added.

It really boils down to which is the most sophisticated department. But I strongly suspect that in the larger companies, the most logical place to put a consolidated function would be in data processing.

John Lane

Where the merged function falls depends on the company. What kind of network do they need? Voice and data will probably remain separate entities but under one realm — communications.

Judith Lane

Just as the question of where the merged function will fall depends on the individual organization, the answer to the conflict between DP and communications depends on each particular case. There is no simple solution to the problem; in extreme cases, the only possible answer may be a complete reorganization, restaffing and time to heal.

Although the problem can rarely be avoided, it can be cushioned. Managers need to educate themselves, to learn more about the other discipline, keep an open mind. This is easier said than done, for there is a vacuum in the market for managers with a working knowledge of both disciplines. However, there is a world of opportunity for managers able to ride the wave of change.

Is there hope, then, for an eventual resolution of the conflict between voice communications and data communications managers?

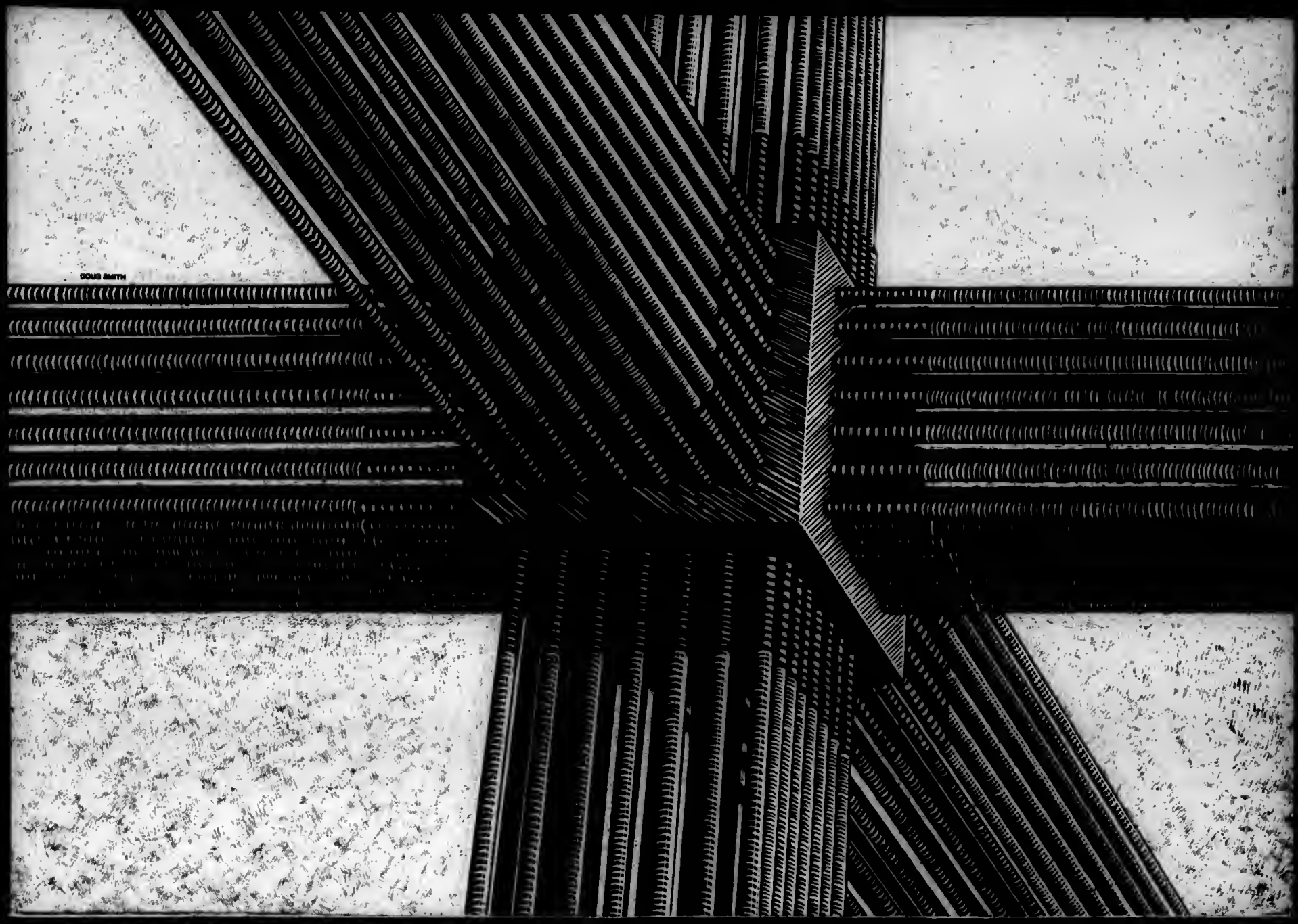
The two will always be fighting to some extent. Their priorities tend to be different, their background, training. I'm not sure you'll ever get a perfect blend of that.

John Lane

I think ideally, the two can work happily together, but they must be administered. One person manages the information and the other makes sure that Jack can talk to Jill — and it doesn't matter whether Jack is a computer and Jill is a computer or Jack is a manager and Jill is a customer or whatever.

Judith Lane

Will Judith Lane's prediction prove right? Or will the conflict continue? Only time will tell. ■


DOUG SMITH

THE UNCERTAIN FUTURE OF CENTREX

BY JEFF KAPLAN

One of the most important issues facing many telecommunications managers as they attempt to adjust to the new AT&T and reacquaint themselves with their local telephone companies is what to do about their Centrex systems. The Federal Communications Commission's (FCC) Feb. 3 decision to stand by its local access charge scheme for Centrex services may mean significant increases of $2 per line per month in the telephone bills of Centrex subscribers. This prospect may drive these major users away from Centrex, leaving the local operating companies with a huge chunk of unused central office switch capacity. In addition, it may settle small business and residential users with even higher local telephone costs.

However, favorable state tariff rulings permitting more flexible pricing and rate stability may help to offset the added access charges and limit the amount of migration away from the Centrex service.

For the uninitiated, a brief description of the Centrex system is in order. Basically, Centrex is a service offered by all the Bell operating companies and a handful of independent telephone companies. It links each of an organization's telephones to a central office switch located at the operating company's plant. The service was first developed in the early '60s to give large organizations direct dialing capability in and out of the organization. The system evolved to include basic station features such as intecom, call holding and call transfer.

Eventually, two forms of Centrex emerged. Centrex-CO has been the standard service emanating from the central office switch. Centrex-CU combined basic central office service with additional on-premises switching. As a result of AT&T's efforts to move subscribers toward its private branch exchange (PBX) products, the Bell operating companies no longer offer Centrex-CU.

The debate over the local access charge plan has brought together strange bedfellows, like the local operating companies and state regulatory agencies that oppose the plan. It has also brought out some of the subtle tensions that have been brewing between AT&T and its newly emancipated operating companies. (This debate is elaborated on in "Pro and Con," Page 4).

But based on extensive interviews with federal and state regulators, congressional staff, interconnect industry representatives and marketing people in the Bell operating companies, International Data Corp. (IDC) believes that predictions of Centrex's abandonment and demise in 1984 and after may be exaggerated.

There were approximately 7,425 Centrex systems installed at the end of 1983, according to the North American Telephone Association (Nata). This represents a 50% drop in the number of systems installed since 1981, when 15,100 systems were in place. This number appears relatively small when compared with the nearly 21 million PBXs that Nata estimates are currently installed in the U.S.

However, it is unfair to compare the number of Centrex systems with the number of PBX instruments in place. The operating companies charge Centrex users on a per line basis. And new central office switches enable the Bell operating companies to offer customized Centrex service with additional features to smaller offices with fewer telephones than in the past. Because the service can now be directed at smaller clusters of telephones, the number of lines served is more important than the number of systems installed. Some analysts guess that 60% of the Fortune 500 companies and an even greater percentage of major nonprofit institutions use Centrex.

Centrex service represents a major component of the basic operations and revenue structure of the Bell operating companies. In Massachusetts, 122,000, or 22%, of New England Telephone Co.'s 579,000 business lines are dedicated to the Centrex-CO service. Over 52% of the main station lines provided by Chesapeake and Potomac Telephone Co. in the Washington, D.C., area use the Centrex system. And approximately 46% of the business lines in California are serviced by Centrex.

As an office switching service that provides an array of station features to improve telephone efficiency in organizations, the Centrex-CO competes head-on with PBX systems. The fundamental difference between the two is that Centrex performs all switching functions off-premises by establishing a separate loop for each telephone station, while the PBX is installed on the premises where it switches stations internally and feeds and sends external calls through trunks.

There are additional factors that differentiate the two systems. Financing and service have been the two most important. Centrex users pay an installation fee and monthly charge per station adjusted by the number of stations connected to the central office switch and the add-on features requested. This permits smaller organizations or organizations with limited funds to avoid a heavy capital outlay for an on-premises switching center. Total system shutdowns are also avoided under Centrex because each station is individually linked to the central office switch. PBXs require special power-support systems to ensure that an organization's telephone lines are not lost if the office suffers a power blackout.

PBX systems offer the user greater control and cost savings through customized design for an organization's unique needs. Organizations can expense their financing costs and depreciate the system over time. After system features, relative independence from the local operating company is the intangible goal and advantage that PBX vendors emphasize most.

Both systems were originally ▶

Kaplan is a senior market analyst in telecommunications for IDC's Communications Research Program, Framingham, Mass.

configured for analog transmission, but today's trend is toward digital traffic capability. Third-generation PBXs offer add-on digital transmission capability, and analog/digital converters have been used to permit data communications through the Centrex system. The Bell operating companies have been making a concerted effort to replace or upgrade their central office switches to permit routine high-speed data traffic. At the same time, fourth-generation, fully digital PBX systems are expected to come to market within the year.

Because they add an additional system to the telephone network, PBX systems can cause some switching impairment on-premises and transmission degradation. But PBX users have been willing to make this short-term sacrifice while the overall telephone network is upgraded to accommodate the on-premises systems.

Centrex began to lose its luster in the late '70s. AT&T strategists believed that Centrex could not compete against the new PBX offerings over the long haul. As a state-regulated service, Centrex lacked the price flexibility necessary to compete in a price-sensitive market. And under the Modified Final Judgment of 1982, the divestiture plan accepted by AT&T and the Justice Department, the Bell operating companies were prevented from providing enhanced services and customer premises equipment unless they set up separate unregulated subsidiaries. This severely limited the operating companies' ability to market Centrex.

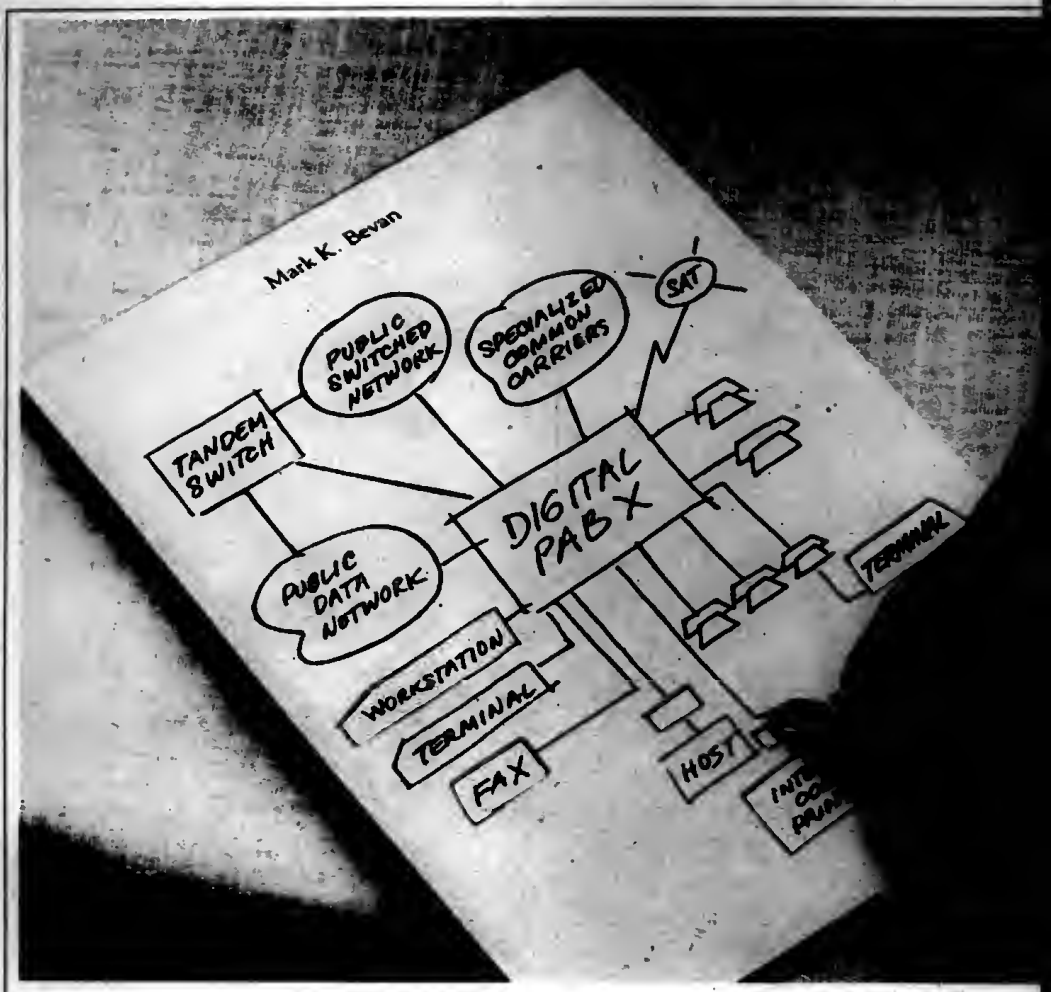
AT&T introduced its own PBX, the Dimension system, and instructed the Bell operating companies to push its offering. Centrex was not stressed in AT&T's 1982 market strategy.

The Dimension system and early System 85 releases encountered a series of engineering and delivery problems. American Bell, Inc., AT&T's unregulated subsidiary responsible for marketing PBX products, struggled through internal political and organizational problems as well. It emerged with a new name, AT&T Information Systems, and a credibility problem to overcome.

The Bell operating companies attempted to make the most of a difficult situation. AT&T had negotiated a favorable deal with the Justice Department, which freed it of the burdens of local operations and state regulators. It took the most profitable business — long-distance services. It preserved its vertical integration by retaining Bell Laboratories, its research and development arm; AT&T Technologies, formerly Western Electric, its manufacturing operation; and AT&T Information Systems, its young marketing vehicle. It left the Bell operating companies with the difficult task of local switching and service. The Bell operating companies were given Centrex and its significant central office switch investment, but they were not given the freedom that they needed to earn the return that they required.

The Bell operating companies attempted to salvage Centrex and pushed favorable tariff decisions

The Bell operating companies have been making a concerted effort to replace or upgrade their central office switches to permit routine high-speed data traffic.



through state public utility commissions. The tariff agreements permitted more flexible rates and long-term contracts that ensured rate stability. They lowered or eliminated their minimum line requirements, allowing smaller offices to take advantage of Centrex. This also allowed the Bell operating companies to expand their market base. Pacific Northwest Bell gained approval of a new Centrex system called Centraflex, which is offered to business and residential subscribers with only two lines or more. And the operating companies continued to add service features, such as call forwarding and station message detail recording, to remain competitive with PBX offerings.

On Dec. 22, 1982, the FCC issued its Third Report and Order, which called for local access charges, including the customer access line charges that concern Centrex users and the Bell operating companies. Under the FCC's original plan, all lines entering a local operating company's central office switch would be charged a monthly access fee beginning Jan. 1, 1984. The plan was based on the premise that all users of the local telephone network should pay for the fixed or nontraffic-sensitive costs associated with operating the system.

The FCC's plan was the first step in its efforts to transform the regulated telephone rate structure into a cost-based system. Rather than allow long-distance users to continue to subsidize the local network through artificially established rates, the FCC determined that the AT&T breakup should serve as an impetus for a more rational rate structure.

The FCC proposed that residential users should be charged a maximum of $2 per month per line beginning in 1984 and eventually pay a maximum of $6 a month per line in 1986. Business users would immediately pay a maximum of $6 a month per line.

The FCC's plan generated overwhelming opposition. On July 27, 1983, in response to 35 petitions, the FCC issued a Memorandum Opinion and Reconsideration Order modifying its original plan. Under the new proposal, which was published in August, residential and Centrex users would pay a maximum of $2 per line each month for existing lines as of July 27, 1983. The monthly rate would increase $1 per year in 1985 and 1986. New Centrex users or expanded Centrex systems would pay the full $6 per month charge for their new Centrex lines.

Although the FCC reduced the immediate rate shock of its original order, the Bell operating companies and Centrex users were only mildly relieved by the new plan. Under the FCC's modified formula, Centrex users could still pay more than 10 times as much as PBX users in monthly fees. That is because each of the telephones in a Centrex subscriber's office will be charged for tying into the central office switch, while the PBX user will only pay for the trunks that carry its external calls to and from the central office switch.

THE BURDEN of the access charges may fall most heavily on major nonprofit institutions that have relied on Centrex systems in the past and lack the financial resources to invest in a PBX system. The Mayo Clinic and its affiliated hospitals in Rochester, Minn., estimate that they will pay $255,864 per year in access fees for Centrex lines under the FCC's revised plan.

The potential impact of the FCC's plan has generated an unusual ground swell of state and federal lobbying. The nonprofit sector has been led by such organizations as the American Hospital Association. The International Communications Association (ICA) filed a petition with the FCC on behalf of Centrex users, requesting

a further reconsideration of the local access charge plan.

State regulators also solicited Centrex user statements and submitted their own petitions to the FCC. The state regulators believe that a large number of Centrex users will abandon the service if the access charge stands. This will leave the Bell operating companies with a significant amount of unused central office switching capacity. In order to recoup their investment in this equipment, the Bell operating companies will be forced to boost their local rates, particularly those of residents and small businesses.

Northwestern Bell estimates that it will lose 92% of its existing Centrex lines within three years if the FCC plan is enforced. Pacific Northwest Bell predicts that all of its 24 largest Centrex users in Washington state, accounting for 72.8% of the state's Centrex lines, will abandon the service by the end of 1986. This will leave a stranded investment of nearly $35 million.

The state regulators asserted in their petitions that although the FCC's plan is well-intentioned, it is poorly designed. They claimed that Centrex rates were set at the state-level to be cost-sensitive and bring an adequate return to support local operating costs. Therefore, the FCC's local access charges would be an unnecessary surtax on Centrex users to cover costs that have already been provided for.

Not only may the FCC's charge on Centrex users be unnecessary, but a petition submitted by Northwestern Bell, Mountain Bell and Pacific Northwest Bell claims that the FCC plan may even be counterproductive. The Bell operating companies predicted that if a major share of their Centrex users abandon the service in the next two years in favor of PBXs, as their surveys indicate they will, then the local operating companies in this region stand to lose $700,000 per month in access fees due to a reduction in the total number of access lines entering central office switches.

As a compromise, the Bell operating companies, state regulators and Centrex users proposed a PBX-equivalency formula to the FCC for determining the local access charges on Centrex subscribers. Under this proposal, a Centrex user with 100 lines would pay the same overall charge as a PBX user with trunking capability up to 100 lines. This proposal was based on the assertion that the bulk of the telephones and lines used by Centrex subscribers are used for intra-office communications. Therefore, their lines are not imposing an equal burden on the central office switch and should not be charged a flat rate. The proponents of this approach suggested that engineering data could have been used to determine an appropriate formula.

The PBX-equivalency concept was vehemently opposed by PBX manufacturers and vendors. Nata, representing the interconnects, attacked the scheme and the Bell operating companies' efforts to protect Centrex.

The interconnects believe that Centrex, by virtue of its direct-line architecture, cannot be equated with PBXs. In their petitions to the FCC, they point out that although each Centrex line may not be used for external communications, each one has that built-in capability, placing the same burden on the central office switch regardless of how it is actually used. Because of this, the interconnects call a PBX-equivalency formula inappropriate.

The second area of contention between the interconnects and the Bell operating companies is over the definition of enhanced services. Under the Computer II decision and the Modified Final Judgment divestiture plan, AT&T and the Bell operating companies were prohibited from offering any products or services that represented an enhancement to their basic transmission function, except through a separate unregulated subsidiary, such as AT&T Information Systems.

The interconnects' petitions to the FCC contend that the new features being offered for Centrex — such as least-cost routing, call forwarding and storage and automatic call distribution — represent enhanced services and violate Computer II and the Modified Final Judgment. The Bell operating companies' petitions respond that the new services are now possible because of hardware enhancements rather than software enhancements and are within the legal restrictions.

AS IF THE CENTREX issue was not confusing enough, Congress decided to get into the act in the fall of 1983. In November, the House of Representatives, concerned about the impact of local access charges on residents and small businesses and the threat they posed on universal service, passed H.R. 4102, which called on the FCC to revise its plan. The legislation did not specifically address the Centrex issue, but instructed the FCC to review its

plan's impact on nonprofit institutions and state and local governments that rely on Centrex.

Congressional aides incorrectly predicted that the Senate would pass similar legislation by February. But the legislation was put off until next year.

The Reagan administration also criticized the FCC plan, but expressed concern about legislative actions that delay or disrupt the smooth implementation of the AT&T divestiture.

AT&T initiated an intense lobbying campaign to prevent Congressional intervention and further modifications of the FCC plan. It threatened to retract its proposed long-distance telephone rate reductions if the access charges were lowered or if they were withdrawn.

Amid all of this controversy and confusion, the FCC decided to delay the implementation of the local access charges until April 3, 1984. Although the FCC continued to stand behind its plan, it has decided to reopen the issue and welcome a new round of petitions concerning the proposed charges.

In a surprise move on Jan. 19, the FCC accepted a staff report recommending that the $2 monthly charge on residential and single-line business users be put off another year to allow the FCC more time to reevaluate its plan. At the same time, the FCC upheld the $6 monthly charge on multiline business users. The Centrex issue was left unanswered until Feb. 3, when the FCC decided to uphold its July 27, 1983 ruling.

It is clear that the FCC made a calculated political move to diffuse the public backlash to its local access charge plan when it postponed the $2 monthly fee on residential and single-line business users and let the charges imposed on multiline users stand. The one-year postponement will push the charges back until after this year's elections, making the charges less of an immediate political issue. But the FCC 's decision to stand by the charges on multiline businesses will certainly generate greater migration from the local telephone networks toward PBX and bypass technologies to avoid the access fees.

It appears that the FCC's decision has ended Washington's role in the access charge controversy for the time being. The ICA will review the FCC's action and may file for further reconsideration on behalf of Centrex users, but no substantive changes are expected from the FCC. And Congressional aides believe that Congress will not come to the rescue of Centrex users in the way that it was willing to intervene on behalf of residential and small businesses.

IN THE MEANTIME, THE Bell operating companies and the Centrex users are not sitting still. The Bell operating companies have submitted new rate filings to state regulators and revised their Centrex pricing schedules to compensate for the local access charges if they do become a reality. Rates are expected to be reduced so that the impact of the charges on subscribers is minimized.

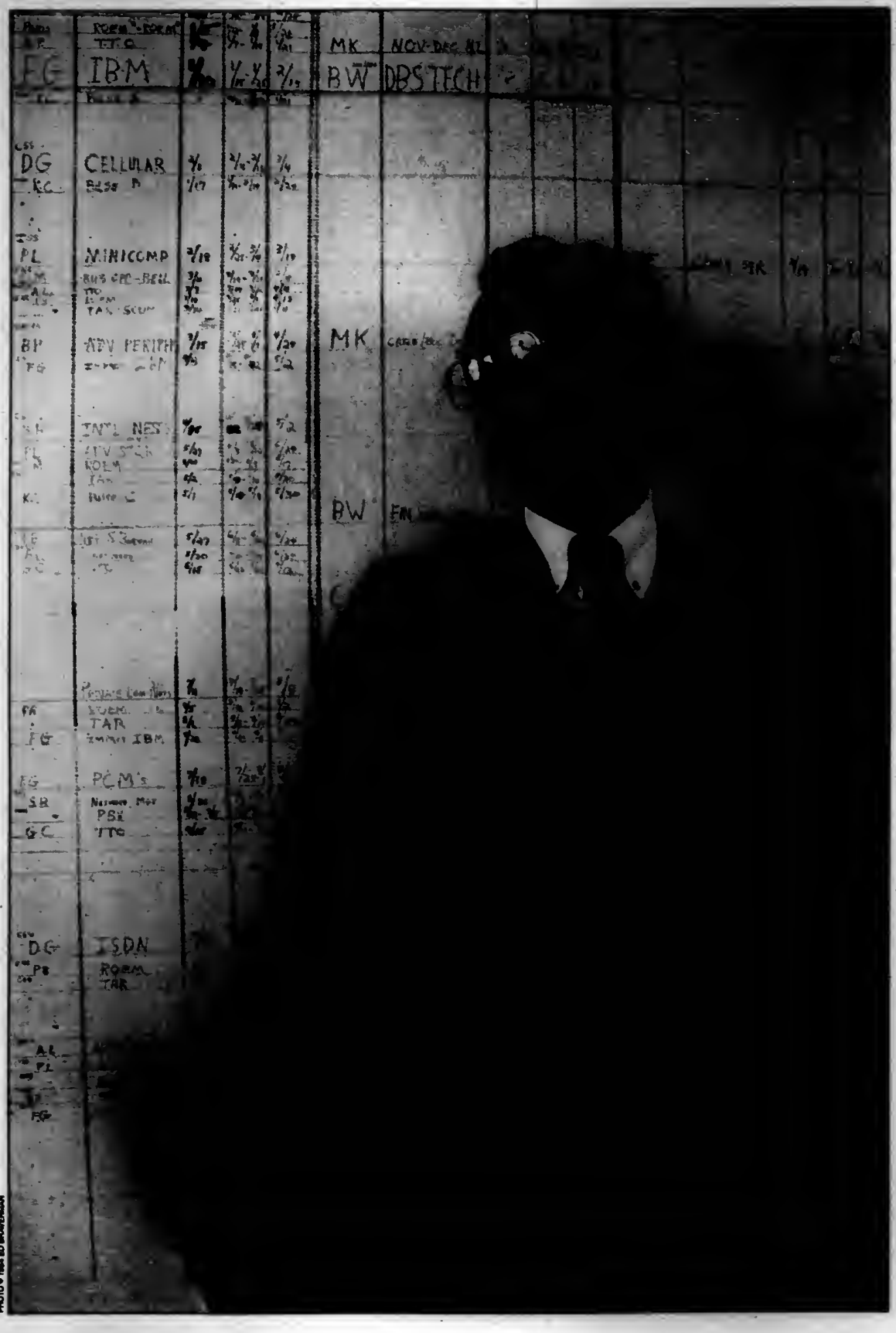
The Bell operating companies are also investigating ways to live with the the concept of structural separations between their regulated and unregulated businesses as outlined in Computer II and the Modified Final Judgment. Although all of the Bell operating companies claim that they have not crossed the invisible line into the area of enhanced services, in recent interviews with IDC, several Bell operating company officials had a difficult time avoiding the term while describing the new features they will offer Centrex subscribers.

Several regional holding companies and Bell operating companies are discussing joint venture agreements with interconnects as one method of circumventing the structural separations requirement. Under these agreements, they will refer Centrex users to the outside vendors for the enhanced service features.

Major Centrex users are not sitting around either. Anticipating that the selection process and installation time for a PBX system is over two years, many Centrex users have issued requests for proposals to PBX vendors to get ready in case the local access charges stand.

Despite the controversy and confusion surrounding Centrex, IDC believes the pronouncements of its demise are premature. Although some of the regional holding companies are still uncertain aobut how to market Centrex, others have been quick to promote it as their flagship service. The regional holding companies and local operating companies have staff committed to the service and are ready to revise prices and add features to hold their subscribers. They believe they offer a viable switching system and that user loyalty and their commitment to service will see them through this challenge.

Because of this determination and the added service features that will be available for Centrex, IDC believes the service will survive the access charge threat and withstand the PBX challenge. ■



Are these the best or worst of times for the communications industry?
The best of times.

Why?
Mao Tse-Tung had an expression: "There is great chaos under the sun, everything is beautiful."

What is it about chaos that's beautiful?
It presents opportunities for users and those vendors that can see the future better than their competitors. Strategy dictates that a company do something that is different from its competitors. Here is the chance to do something different.

Specifically, for whom are these times good?
It is a good time for the regional operating companies. It is a good time for independent equipment manufacturers. It is relatively a good time for new and enhanced services.

Who's having a bad time now?
AT&T. Anytime you go from a 97% market share to something that in four years may be a 64% market share, you don't really stand up and say this is the best of times. I'm talking about AT&T Communications.

How can companies do what you suggest and find the opportunities?
Opportunities never present themselves as multibillion-dollar opportunities. Often they are small niches that are best taken advantage of by quick, flexible, fast moving, aggressive companies such as Rolm [Corp], Intecom, [Inc.], Ztel, [Inc.] When you round to the nearest 100 million, which AT&T does, you cannot get in markets that are small. You are almost muscle-bound.

Look at AT&T Technologies, an enormously competent company. Yet historically, it only entered a market when the market size was sufficient to support its efforts — in fact, when Bell Labs told it to go and get in that business. Well, these markets are often software-driven today, which means they are kind of customized. It's not like turning out products on cookie cutters.

How will AT&T Technologies fare in the new industry?
I think AT&T Technologies is going to break out. I think it has reached the conclusion that its technology is too impressive to be bottled within AT&T Information Systems. It will look at every available distribution system out there as appropriate vehicles for its technology, including value-added resellers, Computerland, Sears and, once again, the operating companies.

What will it take to win the operating companies back?
An act of faith by AT&T management that it can leverage its position in 256K chips, that it will be market-responsive and that the market will actually salute on products that AT&T Technologies may build.

The Inc. *magazine commentator on Howard Anderson's burnished brown office wall cites his communications research company, The Yankee Group, as one of "America's fastest growing private companies in 1982." Yet that is seemingly not enough for its founder and managing director. What more could he expect?*

"The goal of the Yankee Group, and I've never made any bones about this, is world domination," he says. "We want to be the most important company in our industry." For insight on how he expects that to happen, look no further than his business card. Over the company name is the aphorism: "The Network as a Strategic Weapon."

Anderson has already become one of the most important individuals in the communications industry — if public exposure is any measure of importance. Whenever big news breaks in the communications world, as it has so frequently in the past two years, newspapers and magazines call on Anderson for analysis.

The 39-year-old Anderson majored in economics at the University of Pennsylvania and earned an MBA from Harvard Business School in 1968. He worked as a "marketeer" at Sanders, Inc., a computer graphics and facsimile manufacturer. He founded The Yankee Group in 1970 and built it from a one-man operation to a firm with 72 employees and offices in four countries.

The Yankee Group has gone from earning 100% of its revenues from consulting in the early days to just 4% today. Consulting has been supplanted by what Anderson calls "multiclient studies." The studies cover four different areas and are offered to the firm's 425 clients on a subscription basis for $30,000 a year. The goal of the studies is to make sense out of today's turbulent communications times.

A frequent speaker at industry conferences, Anderson combines his forceful delivery with a biting sense of humor. During a recent speech in Washington, D.C., he alluded to his distaste for local-area networks, saying to the audience, "By the way, the Ethernet users group will be meeting outside in the phone booth where they will hold their yearly prayer meeting."

So what does Anderson make of these turbulent times? On Communications *Editor Bruce Hoard interviewed him last month in his Boston office to find out.*

Along those lines, will Bell Laboratories continue to be the preeminent institution it has been?
I disagree with your assumption that it is the preeminent institution. I think that 90% of the problems of AT&T can be directly laid at the feet of Bell Labs. Bell Labs has been a shadow government at AT&T for two decades. Bell Labs made the decisions on what products to make and what not to make. Bell Labs caused development to start or cease. Most manufacturing companies have an R&D lab. AT&T had an R&D lab with an adjunct that did manufacturing. Bell Labs was in fact the tail that wagged the dog.

Can you cite an example?
[Private branch exchanges] — the hottest new market in the U.S. and AT&T did not have an entry.

Why not?
Bell Labs made the decision not to pursue this. One of the reasons was least-cost routing. Putting in a least-cost routing device may give you an equipment advantage, but reduces the amount of long-distance calling. AT&T is a company that historically had Long Lines in the center, and Long Lines always was protected like a king on a chess board. The better the equipment performed, the worse the Long Lines revenue.

What happened was that the users found they could wander off the reservation with a [Northern Telecom, Inc.] SL-1 or with a [Rolm] CBX. Least-cost routing devices like Wats boxes provide an 80% return on investment. With a least-cost routing device, I could take my tie line usage from four hours per day per tie line to seven at no increase in cost. In other words, I'd get almost three free hours of telephoning per day. Bell Labs made the decision not to go in there.

How can AT&T compete?
I think you're going to see AT&T make strategic investments in companies, not unlike what it has done with Olivetti [Co.] or like IBM has done with Intel [Corp.] and Rolm. AT&T realizes it is not going to change the culture of that company overnight. It may not be possible to ever change the culture of AT&T.

Why are things good for the spun-off Bell regional operating companies?
They are a superb distribution system. The real genius of AT&T wasn't Bell; it wasn't his chief engineer Thomas Watson; it was Theodore Vail, because Vail came up with the idea of franchises. And the operating companies are the finest franchise idea since the Catholic Church.

They have always been superb distributors. They were distributing AT&T Technologies gear, and they were distributing Long Lines service for AT&T. They can say, "We are no longer bound to give you only what AT&T Technologies provides, we can give you an Intecom PBX, a NEC Telephones, Inc. Neax 2400 and so forth and so on."

While we are talking about customer

Howard Anderson

premises equipment, what does the sale of embedded customer premises equipment mean? Is it good for people to buy it? Does it lock them into Bell? Will it create a glut of equipment so manufacturers of the fancy new products won't be able to sell their stuff?
It means there is the beginning of a price war, and the user will be the beneficiary of that war. He now has anything from technologically simple to sophisticated equipment to choose from. He may have to put in a special waiting room for all the salesmen who want to call on him. There is not a glut of equipment on the market, and there are 250,000 units that have to be replaced over the next few years. The operating companies are the preferred vendors for customer premises equipment, and Northern Telecom is going crazy supplying it.

What are the implications of users buying all this equipment?
Every major user is becoming what Don Gooding of The Yankee Group calls BYOB — be your own Bell. If you're a large user, you're going to be an integrator. If you have a lot of moves and changes, you're going to hire your own installation and maintenance person to do it. For the sophisticated problems, you may use an operating company.

It used to be if you were a major customer, AT&T Long Lines was where you went. Look at the decisions the user has to make. He's got to make decisions on customers premises equipment. He's probably got 12 decent distributors to choose from — well, make it six. He's got to make decisions on local wiring: Do I do it myself? What do I put in? What kind of topology? Can a hybrid PBX do it? He has to make decisions on local loop: Do I run my own microwave? He has 200 options in the way of long-haul communications. The user has become his own telephone company.

"What I would say to anyone trying to undertand divestiture is that it is a natural occurrence like electrical utilities. You buy your appliances from one person, whether that's General Electric or Sony."

If you had to explain the divestiture of AT&T and deregulation of the communications industry to somebody who was reasonably intelligent but knew nothing about what was happening, how would you tie it all together?
Let me go back a minute. The first research report I wrote was in 1974. It was called "The Unbundling of AT&T." It said the Justice Department will sue AT&T for antitrust. They will attempt to break AT&T into pieces, and they will be successful. The conventional wisdom in 1974, '75 and '76 was that I didn't know what I was talking about. The suit was brought Nov. 21, 1974.

What I would say to anyone trying to undertand divestiture is that it is a natural occurrence like electrical utilities. You buy your appliances from one person, whether that's General Electric or Sony. You buy your electricity from a local generating company.

What's the biggest misconception business users have now about the post-Bell era?
It is going to get easier; the decisions will be more obvious; and they can take a reactive role and still do well. Technology is leaping. The decisions are going to get harder and more complex. The hardest problem that a communications manager or computer manager has is understanding

the implications of the technology before the internal users do.

How are large users meeting the challenge of deregulation?
All users who understand this industry are building embryonic [integrated services digital networks]. Some are completely bypassing the Bell System. For example, Citicorp is putting advanced workstations in the hands of their largest users. They are making econometric data bases and information about money available. What's the price of deutsch marks on the world exchange?

They're helping users by integrating publicly available data bases with privately available data bases. They are then going to put on the roof of your building, for your use or shared use, a [digital termination system], avoiding the local operating company. Finally, in the coup de grace, they have two transponders on Westar V. Citicorp is a registered common carrier.

In the companies that anticipated change, was it top management or is it the people in the trenches of communications and DP that goaded their companies into action?
Top management has to be proselytized. In some cases, top management understands, and it is middle management that will become the impediment. Half the speeches we make are made to boards of directors where top management understands the implications of this. They once asked Napoleon who rules France, and his answer was "10,000 file clerks."

What priorities should users establish?
Put your efforts in those areas that will give you an advantage. Federal Express says, "Our business is threatened not by Emory [Worldwide], not by Airborne [Freight Corp.], not by the U.S. Postal Service. It's threatened by IBM, Wang [Laboratories, Inc.], Digital Equipment [Corp.]."

"The user eventually will be able to bypass us because 60% of our small packages, which itself is 60% of our business, are alphanumerics and computer tapes. Therefore, we will devise a system that can avoid our airplanes all together." That is where you put the technology.

Let me throw a new buzzphrase at you: telecommunications enhanced real estate. Does that mean anything to you?
It sure does. Are we going to see high-tech offices? The answer is yes. What is a high-tech office? It is an office that has high-speed data communications built into the walls and into the roof. It probably has 1.5M bits of data on every desk, available to plug in. It has least-cost routing. It has a building that has parts of artificial intelligence built in. It knows when it is hot; it knows when it is cold. It knows when you are not in the room; it does your energy management; it does security.

"Top management has to be proselytized. In some cases, top management understands, and it is middle management that will become the impediment. Half the speeches we make are made to boards of directors where top management understands the implications of this. They once asked Napoleon who rules France, and his answer was '10,000 file clerks.' "

Is the installed base of twisted-pair wiring usable for speeds up to 1M bit or not? If so, is it usable with the kinds of systems we are talking about here?
Yes. Over short distances, twisted-pair will be fine.

How do you view the controversy over access charges?
There is a lot of double-talk about access charges. A Centrex system is a shared PBX. It is a central office PBX. Some say Centrex is no longer viable with the new access charges. Baloney. Two of our clients, Prudential Insurance [Co.] and General Motors [Corp.], share with us the idea that the local operating company would manage to keep their costs under control. Who gets the access charge? The local operating company. If Centrex charges $30 before access charges, and now the access charge comes in at $6, could not

that Centrex charge go to $24? What is the net result: $30 to the operating company.

What's in the future for Centrex?
What we need and what we are seeing is the next generation of central offices, the next generation of Centrex, what we call super Centrex. It will probably be done on devices like a DMS 100 from Northern Telecom.

We are telling our largest users now that they do not want a PBX in some cases. They want a central office. If they are going to be their own telephone company, then go all the way, buy a central office. A shared-use central office and a shared PBX are one and the same thing. I can use microwave development to share a PBX here with Sheraton Hotels up the street by putting a little dish on the top of my roof.

What are the implications of the Supreme Court decision in the Litton [Industries, Inc.] antitrust suit against AT&T? I mean, will costs and liabilities eventually be passed down to the [Bell operating companies] if the other 50 pending cases go the same way as Litton's? Is this a tempest in a teapot?
It is a real concern. That money will eventually be paid by every homeowner and every business in America.

Even if nobody else wins, if Litton is the only successful litigant?
The rules of monopolistic practice are vague enough so that if a judge or jury is convinced one side is truly wrong, he can award that way.

And one case going to completion is almost a priori evidence that others stand a chance of succeeding.

What do people think of Howard Anderson?
Hopefully what they think is, original thinker, occasionally arrogant.

When?
When arrogant? In that the goal of the Yankee Group — and I've never made any bones about this — is easily world domination. We want to be the most important company in our industry. We want the vendors to build the systems that we think the market will want.

"The goal of the Yankee Group — and I've never made any bones about this — is easily world domination. We want to be the most important company in our industry. We want users to buy systems that will be forward processing."

We want the users to buy systems that will be forward processing, that will forgive without penalty.

I think I am regarded as a good, occasionally exceptional speaker. I think the company is representative of both my strengths and weaknesses.

Your weaknesses being?
Oh, sometimes a tendency to go right to the conclusion without building every logical step. The tendency to want to lead the industry as opposed to follow the industry.

What kind of crowd turns you on when you're speaking?
The smarter the better.

How can you tell a smart crowd?
They laugh at the right time. ■

WESTINGHOUSE'S MICROWAVE MARVEL

BY KATHERINE HAFNER

PITTSBURGH, Pa. — Pittsburgh is filled with surprises these days. The city Charles Dickens once described as "that ugly confusion of backs of buildings" is enjoying a reincarnation as a cultural and corporate mecca, attracting enough diverse talent to rival the haughtiest of metropolises.

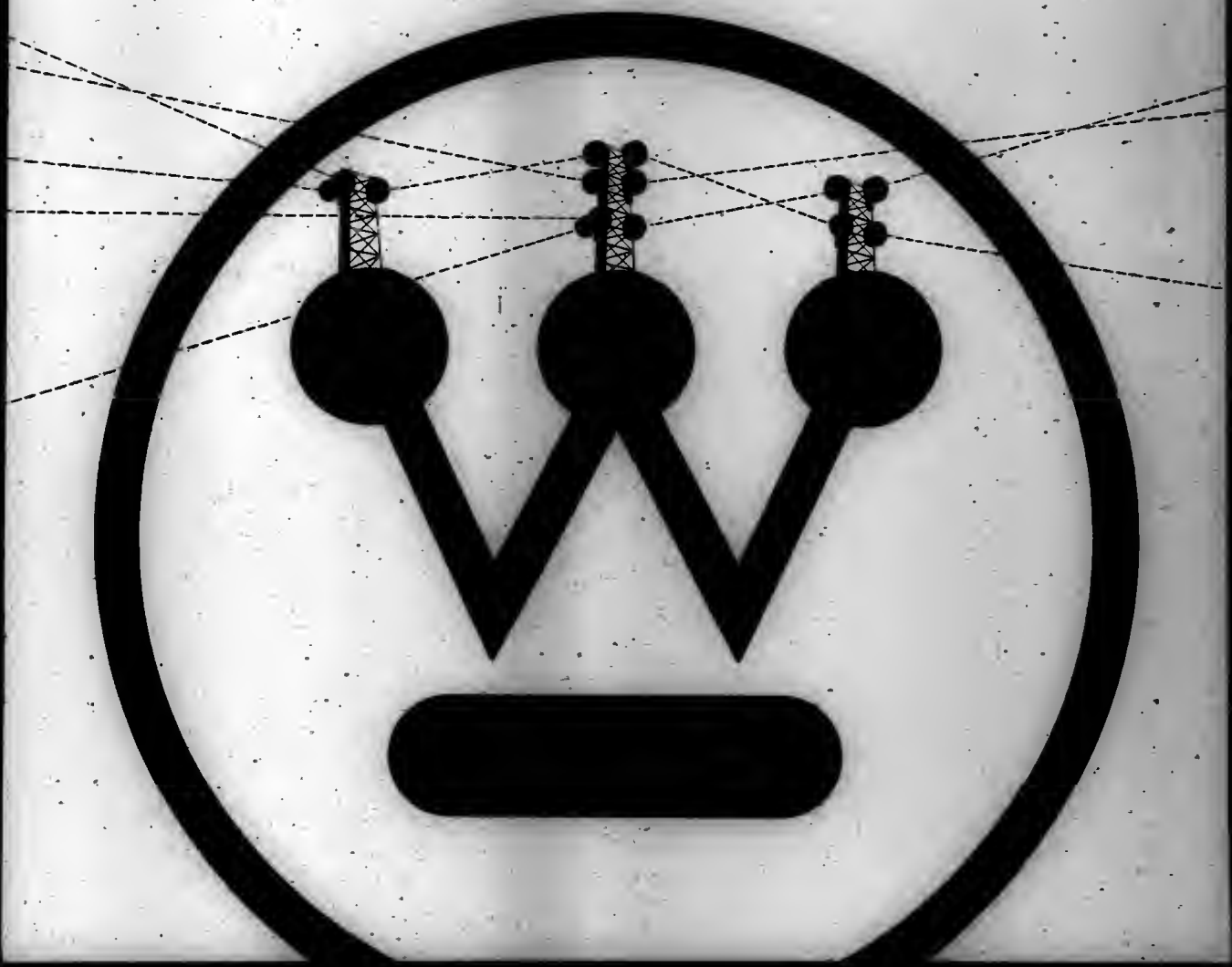
In fact, Pittsburgh is the nation's third largest center for corporate headquarters. And not least among the occupants is Westinghouse Electric Corp., the industrial conglomerate whose commitment to the Pittsburgh metropolitan area has traditionally run wide and deep.

Hafner is staff writer for On Communications.

In the past few years, however, Westinghouse has literally passed over its locale by installing a private digital microwave communications network that blankets the metropolitan Pittsburgh area. This network deprives Bell of Pennsylvania of $500,000 to $1 million a year in transmission revenues and equipment rentals. According to Westinghouse's own projections, the private network will produce some $66 million in savings over a 10-year period.

Spanning a 20-mile radius, the $26-million Westinghouse Digital Information Network (Wesdin) serves 15,000 Westinghouse employees, primarily for voice communications. With the network in place, Westinghouse has managed to bypass the local operating company almost completely, according to Robert Bennis, Westinghouse's communications systems manager.

Barring the passage of costly tariff legislation, the private setup is expected to pay for itself by 1988. Bennis frowns on pending legislation that would place a surcharge on those who bypass local operating companies. While he has not yet calculated the cost of operating the network if the ▶



bypass legislation becomes law, Bennis is not encouraged by his initial estimates.

"It sounds like they want to penalize bypassers to a point where it would be economically unattractive to bypass and sock you for more than it would cost you to have a private system," Bennis said. He considers the bypass bill a "misguided" piece of legislation. "I don't think it is necessary. Given the nature of the divestiture process and the effort the [Federal Communications Commission] has made to address the kinds of concerns that the bill supposedly addresses, I think it is counter-productive."

The headquarters for telecommunications at Westinghouse are as inconspicuous as Wesdin's radio towers are imposing. The telecommunications division is tucked between Frank's Jewelry and Ardmore Beauty Supplies in the shopping center 10 miles east of Pittsburgh.

Wesdin, often cited as the most advanced and technologically innovative network of its kind, was not so much the result of tremendous technological foresight as necessity.

The headquarters for telecommunications at Westinghouse are as inconspicuous as Wesdin's radio towers for transmitting and receiving signals are imposing. The telecommunications division is tucked between Frank's Jewelry and Ardmore Beauty Supplies in the Forest Hills shopping center 10 miles east of Pittsburgh. It is there that Bennis, his engineers and managers implemented the private communications system for Westinghouse, which four years ago anticipated concerns that would crop up as a result of AT&T's divestiture in 1984.

According to Bennis, communications staff members at Westinghouse began to think seriously about installing its network when the Centrex service that had been in place for 15 years first headed for obsolescence. Bell of Pennsylvania notified Westinghouse that the local telephone company was considering the termination of its Centrex offering and planned to file with the local utilities commission for a substantial rate increase.

"Their original indications were that they would phase out Centrex and encourage users to install the new Dimension [private branch exchange] system," Bennis said. "We didn't want to be forced to have one option of either seeing Centrex gradually phased out or become prohibitively costly, with the only alternative being to pull Centrex out and replace it completely with a Dimension system. We didn't feel that was the only alternative that should have been made available."

So with plenty of lead time, Bennis and his group then began to evaluate different ideas for a private network. The only strict criterion, according to Bennis, was that the network be digitally based and that it employ "technology of the future."

Bennis explained, "If we were going to make a change of this type, we wanted to go with a technically superior kind of system."

So Westinghouse, whose total communications expenses reach as much as $100 million per year, went shopping for a private voice and data communications network

that would bypass Bell of Pennsylvania and integrate such office automation capabilities as facsimile transmission and eventually video transmission.

"We gave vendors one page of specifications with 13 items on it," William Hunkele, operations manager at Westinghouse, said. The chief system requirements included all-digital facilities, touch-tone dialing, centralized operators, least-cost routing and transmission capabilities up to 56K bit/sec.

After a lengthy and thorough evaluation of each vendor, the contenders for the project were narrowed down to Bell of Pennsylvania, General Dynamics Communications Co. and GTE Business Communications Systems, Inc.

"Bell of Pennsylvania finally withdrew on the basis that it didn't have the kind of capability we were asking for in the time frame we wanted it," Bennis said. "We wanted to begin installation in the early part of 1981. So that left General Dynamics and GTE. We finally selected GTE primarily on the basis of price, technical capabilities of the proposal and the kind of project management capability they demonstrated."

INSTALLATION OF THE GTE system began on schedule in February, and the last node was in place "on schedule and within the budget" in December 1983, Bennis said. Westinghouse employees and machines communicate with one another through a series of GTD PBXs. The "hub and spoke" configuration of Wesdin revolves around three major tandem switches, incorporating six GTD 4600 PBXs, which handle up to 10,000 lines, 12 GTD 1000 PBXs, carrying up to 1,000 lines, and two GTD 120 PBXs. The end-to-end digital network connects 23 locations, either with digital microwave links operating on an industrial bandwidth at 2-, 12- and 18 GHz, with the bulk of the traffic on the 12 GHz channels, or with coaxial cable.

The PBXs themselves provide dial-up switching capability, along with synchronous data speeds reaching 56K bit/sec. Utilizing the digital transmission facilities, dedicated data circuits provide host-to-host and terminal-to-host transmission capabilities.

The hub of the network is Westinghouse's Network Control Center, about two miles up the hill from the telecommunications office. The status of the system is tracked at the control center, and corporate telecommunications data is gathered and processed by a Digital Equipment Corp. PDP 11/70 16-bit minicomputer. In a room with a wall-sized map of the U.S. covered with blue and red blinking lights, control operators monitor Westinghouse's nationwide communications network of 4,500 circuits at 1,000 locations, as well as the local Wesdin.

Bennis said that in his 19 years at Westinghouse, Wesdin is the most technologically advanced project he has been involved with and is "certainly the largest in terms of cost and magnitude."

The only hindrance to the completion of the network, Bennis noted, was community opposition to the building of a radio tower that would have changed the complexion of a local residential area.

"Putting those towers up was sort of an emotional thing for some of the residents in the towns where they would go," Bennis said. "We had originally planned to put a 110-foot tower on property owned by Westinghouse, and the town withdrew its initial approval. So we had to go look for another site."

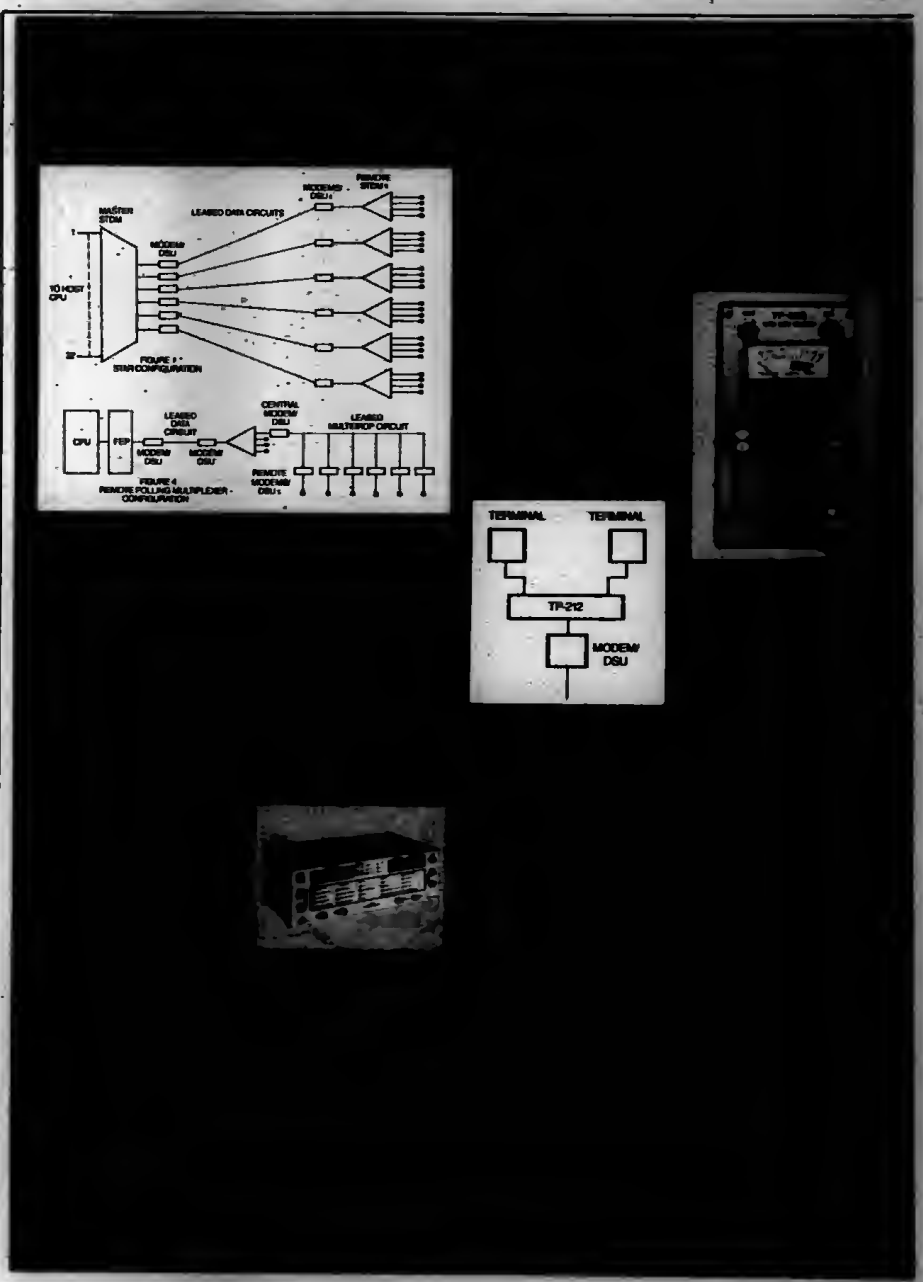
Westinghouse uses four radio towers for the network, two of which the company constructed itself. The highest of the towers stands 250 feet tall, looming over the eastern section of the metropolitan area, with seven receiving dishes hanging off its sides.

According to Bennis, Wesdin is completely transparent to the end users, most of whom use the system for voice communications, which makes up the bulk of the transmission over the network, leaving only 8% to 12% to data traffic. An even smaller percentage of the network traffic is devoted to facsimile and fast-freeze video transmission, which are still in the experimental stages, Bennis said.

Aside from a few additional "software glitches that gave us heartburn for 24 hours" and some "technical crises," the installation of the system went smoothly, Bennis said.

The system was phased in gradually; the first large system was constructed in east Pittsburgh, where the Tele-Computer center, or the control point for the rest of the network, originated. Additional nodes to the system were gradually installed, and it was not until the spring of 1983 that the microwave portion of the system became operational. As of now, the network is 95% complete.

Westinghouse recently built a second private microwave network in Puerto Rico, where the company operates 30 assembly plants. The analog microwave network in Puerto Rico was installed



in the last two years for accommodation of "fairly significant communications between the Puerto Rico plants and their parent plant in the U.S.," Bennis said. "The existing network had unreliable facilities and problems brought about by storms and water seepage. After many years of struggling to communicate, we decided to put in our own system."

Bennis is also quick to note that Westinghouse does not have a total bypass system. "Some of our locations are using Bell facilities, and all our backup lines are through Bell," Bennis explained. "So this is not 100% private microwave. It is actually evolving into a hybrid system."

While more than 90% of the Pittsburgh system operates on digital microwave, Bennis said that Bell of Pennsylvania, now competitive as a subsidiary of Bell Atlantic, is negotiating with Westinghouse to provide the company with a fiber-optic system. This system would would augment existing facilities.

Bennis explained, "1984 is a big transition year with a lot of churning and confusion and juggling around of tariffs and rates and everybody trying to get part of the turf. But once we get over the transition and the enormous amount of misconception that's been generated by this thing, it will be interesting. The innovative possibilities will begin to surface even more than they have in the past."

"Since we have gone the microwave route, Bell of Pennsylvania has become very interested in joining with us in the development of the network," Bennis said.

"They have been proposing that we add more locations to the original Wesdin project. Rather than put in another microwave link, they'd like us to consider putting in fiber-optic capability," he explained.

"I think that looks like a very viable alternative. Fiber optics is hard-wired so we wouldn't have to be as concerned about security as we are with the radio system. And I don't have to invest capital dollars. I can consider an operating lease."

And as a result of the AT&T divestiture, Bell of Pennsylvania is now ready to compete for Westinghouse's business. "We view Westinghouse as a very important customer," Jack Patterson, marketing manager for Bell of Pennsylvania, said.

For its long-haul links, Westinghouse relies on AT&T's Enhanced Private Switch Communication Service, a standard private network package AT&T provides to two dozen private corporations. The company also maintains a companywide electronic mail system, which connects 28 foreign countries with Westinghouse offices.

Westinghouse is served by a variety of suppliers, each of which meets a different communications requirement for the company. In addition to AT&T, the company subscribes to both MCI Communications Corp. and GTE Sprint for long-distance services. Bennis said the telephone systems come from "all the major suppliers," including Rolm Corp., Northern Telecom, Inc., Hitachi Ltd. and Stromberg-Carlson.

In addition, the electronic mail service is provided by ITT Dial-Com, and Westinghouse also uses the packet-switching services of GTE Telenet, Inc. and Tymnet, Inc.

"As you can see, we've been in the business of dealing with non-Bell suppliers since the mid-'70s," Bennis pointed out. "I even think we were MCI's second customer."

Bennis believes the future growth of the network depends largely on whatever happens to the telecommunications industry as a whole in coming months.

He explained, "1984 is a big transition year with a lot of churning and confusion and juggling around of tariffs and rates and everybody trying to get part of the turf. But once we get over the transition and the enormous amount of misconception that's been generated by this thing, it will be pretty interesting.

"The innovative possibilities will begin to surface even more than they have in the past," Bennis added.

"And I think that as the user, we're going to have a pretty full plate to choose from." ■

Special Section: Local-Area Networks

AFTER THE STORM

As general manager and vice-president of Xerox Corp.'s Office Products Division between 1979 and 1982, David Liddle was on the front lines of the Great Local-Area Network Battle. The battle pitted Ethernet, Xerox's innovative baseband local net that was introduced in 1981, against the rest of the communications world. The primary battleground was the trade press. Although Xerox fired the first salvo with its widely covered Ethernet introduction, it wasn't long before the company — whose forces were marshaled by Liddle — found itself under heavy attack from all sides. And the attacks were dutifully reported in the newspapers and magazines covering the communications scene.

The fight basically revolved around two transmission techniques: baseband as employed by Xerox, and broadband, the ▶

David Liddle

chosen method of Wang Laboratories, Inc., Sytek, Inc. and others. Baseband features only one channel for message transmission while broadband offers multiple channels.

Xerox and Ethernet looked worse and worse as the conflict continued. Then, just as quickly as it had started, the battle was over.

Third-party negotiators pointed out the fact that the two rivals could coexist. It was the application, not the technology, that mattered. The media lost its appetite for the fray. End of battle. Uneasy truce.

Liddle and former Xerox Office Products Division President Donald Massaro left Xerox to start Metaphor Computer Systems in October 1982. Metaphor expects to have its first products available later this year. According to Liddle, they will provide local and remote access for business communications users.

On Communications *Editor Bruce Hoard talked with Liddle recently about the Ethernet days and found him far more open and opinionated than ever before.*

What emotions do you experience when you remember the days when Ethernet was first introduced?

Well, it is complex. I feel good about it in the sense that Ethernet has actually done all the things that people were skeptical about: that it could become a standard or be widely adopted or that vendors would make parts for it. In that respect, that has all happened.

I was surprised — in retrospect, I shouldn't have been — at how much basic resistance there was to the idea of adopting a local-area network standard. I thought it would be relatively easy because Ethernet was well described; we had a lot of experience with it.

There were several major vendors signed up for it, so it wasn't a proprietary advantage to any particular class of vendor.

And I remember back then wondering why there was so much foot-dragging.

There were quite a lot of people who attended all the meetings without any real enthusiasm to push something through, simply out of the fear that somebody's ox would get gored if anything became a standard.

"There were quite a lot of people who attended all the meetings without any real enthusiasm to push something through, simply out of the fear that somebody's ox would get gored if anything became a standard."

So, looking back on it, is that how you would explain the foot-dragging?

Yeah. You see, the problem with the foot-draggers is that almost all of them have come around one way or another, either to the Ethernet standard or a close variation of it.

Will you name any names there?

You probably recall that [Hewlett-Packard Co.] went through a period of reluctance, and the executive vice-president was saying that Ethernet had "dangerous grounding and finite addressing." Of course, HP adopted Ethernet and uses it now. They simply wanted to put their

fingerprints all over whatever was adopted as a standard, feeling that they were otherwise going to be at a marketing disadvantage with Xerox and [Digital Equipment Corp.], I guess.

HP held things up for a long time and turned around at the last minute and said, "Yeah, well OK, we ought to approve this now. This is all right after all."

That was sort of a surprise to me, because HP is a very progressive company. They've done a lot in the general area of standards, and there were never really any technical disagreements about it. It was more a question of: "What will this mean to us out there in the marketplace?"

"We were just trying to say, 'Look guys, this isn't a galactic telecommunications system. It's a simple network. You ought to be able to hook lots of different kinds of stuff to it, and we at Xerox are committed to making that happen.' "

And I shouldn't just characterize HP that way, because I think a lot of companies felt that way. There was a certain fear that Xerox, DEC and Intel [Corp.] had something "up their sleeves" or some hidden thing on the agenda, and that simply was not true.

We all wanted to create a situation in which we thought we all would be able to sell a lot of products by having it be more interconnectable.

There was a lot of talk about baseband vs. broadband confrontations at IEEE-802 meetings and that the Wang people in particular were against Ethernet.

That was really different in that it was solely a marketing motivation. I mean, if you go to those guys now, you can find that they've basically just quit and given up on it.

Given up on Wangnet?

Sure. By any comparison to all the wild claims that they made. But, if you think about what happened there, we introduced Ethernet as a simple concept.

We were just trying to say, "Look guys, this isn't a galactic telecommunications system. It's a simple network. You ought to be able to hook lots of different kinds of stuff to it, and we at Xerox are committed to making that happen."

Well, that was more simplistic than we meant it to be. Many, many customers turned around and said, "Well, gosh, here's a network I can hook everything to. What are you doing Wang? What are you doing, IBM, along these lines?"

And that became very threatening, if you see what I mean. That was not what we intended to do, but that was part of the reaction. And so Wang immediately jumped up and said, "Whatever you can do, we can do twice as well.

Ours will not only be broadband, but will go at 12M bits in the high end, the Wangband, rather than the 10M bits that you're doing."

And they made a lot of claims that it had a specification and a price long before they had done any real development.

What has happened since those early days in the area of local networks

David Liddle

that you least expected to happen?

The thing that I least expected was that the IEEE would agree to endorse, at least discuss endorsing, a network standard with a totally exhorbitant licensing fee like the one for the ring net.

The first thing that happened following the first meeting of the IEEE-802 committee was that committee chairman Maris Graube called me up and said, "Now David, we can't proceed any further with even looking at an Ethernet-like standard until you promise us that you'll license it openly at a very reasonable fee — that's IEEE policy."

"We licensed Ethernet for $1,000, and that was just because that was what it literally cost us to process the license paperwork and allocate blocks of addresses. Well, people huffed and puffed about that and said 'OK, 1,000 bucks, that's fair, we'll go along with it.' "

And I said, "OK, we'll do that, let me go off and count the beans." And he said, "Now, IEEE-488 is licensed one-time only for $400." I said, "Right, that was a few years ago, let me go and look at what we can do."

And as you well know, we licensed Ethernet for $1,000, and that was just because that was what it literally cost us to process the license paperwork and allocate blocks of addresses to people who wanted to have a unique address block. Well, people huffed and puffed about that and said "OK, 1,000 bucks, that's fair, we'll go along with it."

But before they could even have another meeting, I had to agree to that and dot the i's and cross the t's.

Now you have this situation where the same group says, "Well, IBM's paid a million bucks or whatever it is [the actual figure was over $5 million] for free rights to this token ring of Soderblom's [Olof Soderblom is the inventor of a local-area network token passing scheme].

I believe that the deal is $65,000 or $75,000 up-front payment plus $50 or $100 per connection [the actual charge is $25,000 up-front plus $45 or 7% of the value of each attached node].

What do you think of that?

It is ludicrous that the IEEE would even discuss it. If I had said that to them, they would have kicked me out. But because IBM is pushing this standard, and the IEEE is so fearful of not "making a standard" around something that IBM has agreed to do, they looked at it differently.

In other words, the arrow's been shot at the barn, so now they want to paint a target around it.

What hasn't happened that you thought would happen?

I thought that broadband campus or backbone-type networks would go a little faster than they have.

You're talking about networks like Sytek, Inc.'s?

I mean they are all in a sense the same. That is, all of those guys offer that kind of a network. Ungermann-Bass, [Inc.] does, Sytek does, 3M [Corp.] does and so on.

I'm not talking about the success of any one

company because the companies are doing fine, but I was just expecting more of them to be out there than there are now.

Why aren't there more of them out there?

I don't really know. I suspect that it's worrying about IBM. It may be because there isn't any standard, and it may be because the connection technology is sort of inherently more expensive until somebody really tries hard to drive those costs down. That, as you know, is what happened with the Ethernet.

How viable are local-area networks as they were originally envisioned? Do people really need multimegabit workstations on their desks?

It sure looks that way to me. Look at the people who are distributing software. Look at the network software trend. For instance, you now have 3com [Corp.], for one, and lots and lots of other people selling their own and other peoples' software in a network configuration.

By that I mean you buy a file server and a networkwide license for software, and you've got one standard set of the software for which you've paid a one-time charge.

That gets downloaded out to the individual workstations, and you get a lot of data that's distributed in that way.

You're seeing more and more use of networks where the stuff that used to go from a disk directly into memory is now passing through a network on the way.

How did you think [private branch exchanges] would fit into the local-area network scene when Ethernet was first introduced?

I always figured that PBX vendors would offer as one of their interfaces a port onto which you could hook an Ethernet to allow traffic along your high bandwidth, processor-oriented devices.

I thought that people would continue to use the PBX to carry voice and to carry relatively low-speed digital data — by that I mean up to 200K bits to support intelligent terminals and things like that.

In your opinion, is that the way that things have more or less evolved?

I don't really know how they've evolved at the PBX level, but I have certainly seen a lot of people do what I just mentioned. I have not seen any significant number of PBXs interconnecting multiple computers or multiple substantial servers.

All the PBXs that I know of that support digital traffic are installed with a lot of terminals getting access to one or two mainframes.

What came out of the great broadband vs. baseband debate?

"I always figured that PBX vendors would offer as one of their interfaces a port onto which you could hook an Ethernet to allow traffic along your high bandwidth, processor-oriented devices. I thought that people would continue to use the PBX to carry voice and relatively low-speed digital data — by that I mean up to 200K bits to support intelligent terminals and things like that."

Baseband. I think that broadband vs. baseband was a marketing approach.

Wang is a remarkably brilliant company sometimes. When they are pressed a little bit, they do really some remarkable competitive things. All of a sudden, you're talking to bankers and manufacturing people and lawyers and everybody else that buys this stuff, and you're talking about modulation techniques, not about whether it costs less or has more data flowing through it.

You're not asking whether there are many vendors supporting it or if you get it to work or if you have to retune it or any of that stuff: These were the reasons we didn't use broadband.

It seemed at the time that Ethernet was really on the losing end of this marketing war. What was it like for you during the period of that war? Did you find yourself getting frustrated?

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David Liddle

Well, yeah, in the sense that yo-yo journalists and consultants were writing a lot of stuff without doing their homework.

I would get a clipping from a sales rep coming back and saying, "A guy at major account X asked us to explain why this is true or why this isn't true."

And as soon as it was cleared up, they wanted to buy X number of workstations. That was incredibly frustrating, the reason being that Wang had gone and said, "Well, we are going to do all this unbelievable stuff, and we are going to do it all 18 months from now."

For a while, you couldn't press them very much on where the results were.

By the way, although it doesn't effect me now, by the time it was clear that Wangnet had failed so miserably and that their claims were so completely unfounded and that they had gone through a whole collection of product managers like tissue paper, the press lost interest.

"By the way, although it doesn't effect me now, by the time it was clear that Wangnet had failed so miserably and that their claims were so unfounded and that they had gone through a collection of product managers like tissue paper, the press lost interest. Nobody ever writes about or cares about Wangnet any more; they're only interested in it as a plausible opponent to Ethernet."

It's funny — nobody ever writes about or cares about Wangnet any more; they're only interested in it as a plausible opponent to Ethernet.

I was frustrated by that at the time, and one of the worst things about it was that in order to hit back effectively at that kind of talk about broadband, you had to trample on some little and fairly worthy broadband vendors that were not making any unreasonable claims at all.

We were trying to offer a real service that everybody needed. I did not want to "fight" against broadband.

The companies like Sytek and Ungermann-Bass and others were building a product that was needed, but not as a local-area network to hook up four separate workstations.

Did Xerox's top management back you at the time?

You bet. They certainly did. They really backed me on all of the Ethernet stuff, and they never wavered about whether it was OK to have done this. They never flinched about all the broadband stuff and all that. They were very good about it.

The president and chief executive officer of Xerox would clearly say where we were going with Ethernet, what we felt was important about that, why we were pursuing the IEEE and why we hadn't gone with broadband and so on. They were really very solid about it.

If you knew then what you know now, what would you have done differently?

I would go to IBM and say "I have seen the future, and I know you're going to have a terrible time with this ring net. Why don't you sign up?"

We did chat with IBM about Ethernet. They looked at it and decided it wasn't a sensible way to go.

But if I were armed with the information that exists now, I'd go to IBM and Wang and say, "Look guys, honest, this isn't a commercial ploy, and it will be a better world for all of us if you agree to use this lower level protocol. You can remain independent in higher level protocols if you choose, but at least we'll be driving down hardware costs and sort of opening the door."

Otherwise, there wasn't a lot that we could have done differently. We threw the door open on it at the earliest moment with [Digital Equipment Corp.] and Intel and swore an oath in blood that we would change those things where it could really be shown that it improved the quality of the product.

But we weren't going to politicize the whole thing and try to fence certain people in and certain people out and all that sort of stuff. I think that was really all we could do. ■

A NETWORK PERSPECTIVE

By Jim Bartimo

Whither the local-area network? While two years ago, the talk of local-area nets seemed unending, today it is almost unfashionable to think about them. "There was a time when a week wouldn't go by when you didn't get a flyer for another seminar on carrier-sense multiple access with collision detection [CSMA/CD] vs. token passing," one Wang Laboratories, Inc. engineer

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Bartimo is senior writer at InfoWorld, *the magazine for microcomputer users, Menlo Park, Calif.*

said with a sigh. .

Even the most astute industry observer has the right to ask, "What happened?" The answer is that a number of factors have changed in the local networking industry since Xerox Corp. released Ethernet, one of the first local-area networks, three years ago.

Although International Data Corp. (IDC) reports that there are approximately 16,000 local-area networks installed today, many users are confused, frightened and suspicious of the technology's slow acceptance in the market.

The introduction of fourth-generation private branch exchanges (PBX) that can switch data at high speeds is but one of the monkey wrenches thrown into the networking picture. Some vendors claim a PBX can fill the need of a local net.

Even the most astute industry observer has the right to ask, "What happened?" The answer is that a number of factors have changed in the local networking industry since Xerox Corp. released Ethernet, one of the first local-area networks, three years ago.

TO DISMAY USers even further, IBM has yet to announce officially a local-area network that would work with its alphabet soup of architectures such as Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC) and Distributed Office Support System (Disoss). IBM's 3270 version of its Personal Computer is another networking tool to consider, since its double personality can use a mainframe for file exchange and other networking functions.

IBM and the PBX came into the picture just when most users were still trying to discern the differences between CSMA/CD- and token-passing access methods; broadband or baseband bandwidths; coaxial, fiber-optic or twisted wire pair cable; and star, ring or bus topologies. For those that did not learn these terms during the first go-round, a brief description is in order:

■ *Broadband vs. baseband.* Broadband local-area networks such as Wang's Wangnet can transmit data, graphics and even video because they feature a wider bandwidth and multiple channels piped through the cable. Baseband networks transmit over only one channel, but one baseband network, Ethernet, is now thought to be a de facto standard by many users and industry observers. Broadband networks are also available from Sytek, Inc. (Localnet) and Ungermann-Bass, Inc. (Net 1), among others.

"I don't think it's an issue of broadband vs. baseband," said Kim Myhre, manager of communications research for IDC. "That is a marketing ploy of the companies that support those technologies. The two technologies work well together.

"For instance, you may have a number of baseband rings connected by one broadband network," Myhre said.

■ *Coaxial, fiber-optic and twisted wire pair cable.* These three types of cable each offer at least one advantage and disadvantage. Coaxial cable is the thick

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cable that subscription television companies use. It offers reliable transmission, but can be costly and cumbersome to install. Fiber-optic cable provides very fast transmission, but can be sensitive to shock. Twisted wire pair cable, although already installed for telephones, is slower in transmission speed.

■ *Token passing vs. CSMA/CD.* Both of these access methods prevent messages from crashing into each other on the network. Token passing is thought to be IBM's preferred method. CSMA/CD is the method used in most other baseband networks, such as Ethernet and Wangnet.

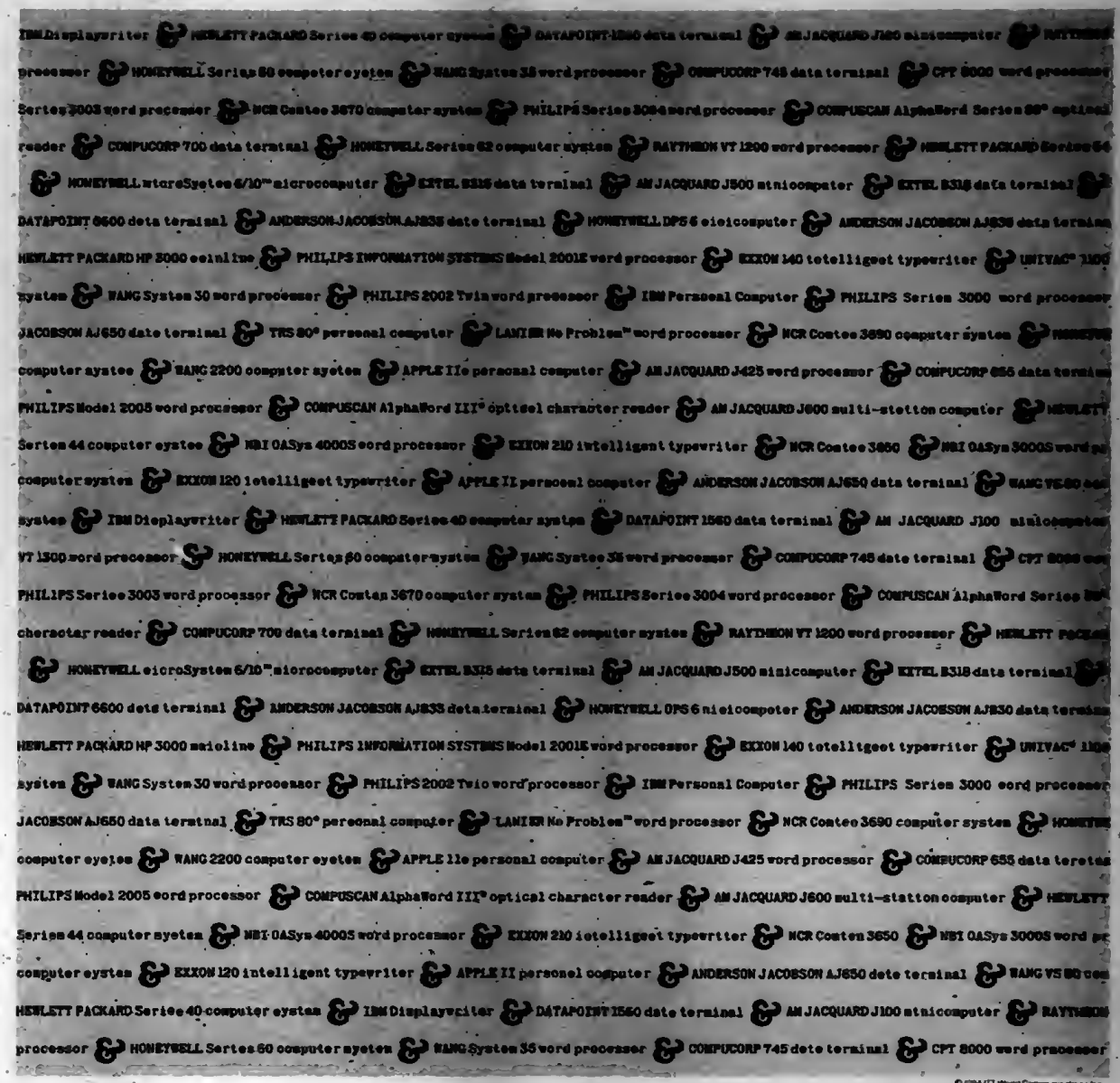
■ *Star, ring and bus topologies.* These three topologies describe the arrangement of the devices on the network. In a star network, all the devices connect to a central node, which is usually a switch or controller. Multiple star networks are sometimes connected to a larger star network to create a hierarchical configuration offering higher and higher levels of connectivity.

Devices in a ring topology hang off a circular connection and therefore must have the capability to recognize which messages are headed for a particular device and which messages should continue around the circle.

As is the case with a string of old-fashioned Christmas lights, if one node fails, so does the entire ring.

In a bus configuration, all devices share a common backbone connection. Because the devices are in effect directly connected to each other via the bus and interface units, the failure of one node does not affect the other nodes in the configuration.

ACCORDING TO Harvey Freeman, vice-president of engineering at Architecture Technology Corp. in Minneapolis, there are three network access standards today: CSMA/CD as used in Ethernet; token bus as used by Concord Data Systems, Inc.; Datapoint



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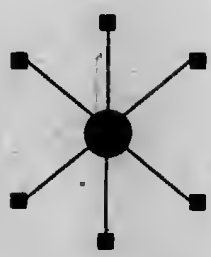


Star Topology

Corp. and Nestar Systems, Inc.; and token ring as used by IBM.

In spite of the confusion over multiple choices, there is hope for the local-area network. IDC predicts a worldwide installed base of 103,210 by 1988.

One user that is extremely pleased with the Ethernet local-area network is the state of Kentucky, an alpha and beta test site for Xerox. "Ethernet has been very good for us," Dobree Adams, director of the state's division of information - resources, explained. "With Ethernet, we have demonstrated real productivity gains," Adams pointed out.

With 300 users on the network and five buildings wired together, the state plans to gateway to IBM's Disoss and to a Wang VS system.

"The ability to transfer graphics is the best feature," Adams said.

Another successful beta test site is Chase Manhattan Bank, which has tied together four buildings in lower Manhattan with Wangnet.

And Chase has plans to widen the network to Long Island via microwave and internationally over packet-switched lines, according to Chase vice-president Harvey Hershkowitz.

As Wang's second largest commercial customer, Chase was a natural candidate for beta testing the network in the late '70s. Considering all the changes in local-area networks since then, does Chase regret experimenting with the technology so early?

"We have no regret because we have a system that is up and running, and that is more than most people can say," Chase's Hershkowitz said.

"We're looking at a new PBX network, but it will coexist with Wangnet," he continued.

Chase's attitude toward local-area networks is perhaps the only successful one to which users of local nets can subscribe. There are so many options that a top-to-bottom approach employing, or at least open to, many different technologies is the most feasible option.

"There are four different approaches," according to Michael French, director of communications studies at Quantum Science Corp. in New York.

"For medium-size office automation, Ethernet is quite a good product," French said. "It has limitations in bandwidth, but it is good for office systems," he explained.

The second approach is the networking of personal computers. This low-end networking is led by Corvus Systems, Inc. and Nestar, which will effectively "link together low-cost personal computers with low traffic," according to French.

Big Blue offers the third approach. According to the *IBM Journal of Research and Development* and a host of industry pundits, the IBM local-area network will be a baseband token-passing ring using twisted-wire pairs to connect a variety of ring topologies.

Finally, AT&T will announce a network this year, French maintained. He added that the new AT&T network will be similar to IBM's, but will tie into the System 85 PBX.

It is interesting to note that AT&T and Wang recently announced a joint agreement that will allow PBX support for Wang's products.

Wang has also announced agreements with Northern Telecom, as have many other data processing vendors. The most notable telecommunications and data processing agreement — Rolm Corp. and IBM — has set the stage for a vendor commitment to hybrid networks.

If gateways to the PBX environment are one half of the local-area network solution, gateways to IBM are the other half. Wang has already announced gateways to SNA for Wangnet. In addition, Xerox claims that it will make a similar announcement sometime in the future.

"SNA serves mainframes, and Ethernet serves the office environment," a Xerox spokesman said.

"We also have a good deal of communications with PBX vendors," the Xerox spokesman continued.

The hybrid network may include baseband, broadband, PBX and IBM 3270 terminal technologies all tied together.

"One should never think of the local-area network alone," said Joseph Ehardt, president of Ehardt and Associates. "People want to see a multivendor approach."

Freeman also espouses the hybrid approach. "Large institutions will use broadband as a backbone for the others such as baseband and the PBX," he said.

Certainly, the price of local-area networks will drop from the $200 to $500 basic connect cost through the use of very large-scale integration. The local-area network controller is being shrunk down by chip makers such as Intel Corp. and Mostek, Inc.

Announced more than a year ago, these chips are expected by industry observers to be available by the end of 1984. As with any technology reduced to a chip, the price will drop dramatically.

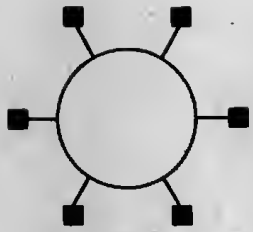
But Myhre is quick to point out that local nets are more than just hardware. In fact, the lack of software is yet another reason some users have stayed away. "Software development has been void," leading to a lot of wires and taps, but no real protocol conversion, he said.

As Hershkowitz put it: "You can call France if you have the telephone, but you still have to speak French to communicate."

According to Dick Parkinson, vice-president of Infotel Systems Corp., B.C., Canada, the software/protocol convetsion void is so severe that "the Ethernets of the world are just an alternative to RS-232."

So with the local-area network coming out of its infancy, users are still awash with alternatives. The ultimate motivating factor will probably not be IBM, the PBX makers or even the chip makers.

In spite of all the problems facing local network planning and implementation, one fact remains, as Hershkowitz and Chase Manhattan found out: "People want one terminal on their desks that can access everything." ■



Ring Topology

High-End Local Net: Miracle or Monster?

The purpose of local-area networks — when all is said and done — is to connect different devices to a CPU for file transfer and peripheral sharing.

Many local-area networks fall short of this goal because they do not perform protocol conversion; they only provide the hardware connection.

Perhaps the low-end Xerox Corp. Ethernets and Wang Laboratories, Inc. Wangnets could take a lesson from two high-end big brothers that have emerged to connect mainframes.

The two most notable mainframe local-area networks are Network Systems Corp.'s Hyperchannel and Control Data Corp.'s Loosely Coupled Network.

Hyperchannel allows transmission at up to 50M bit/sec and, with the use of its Netex software, among unlike mainframes from Digital Equipment Corp., IBM and Sperry Corp.

"When you get these Hyperchannel boxes, they allow IBM to talk to other mainframes," Dick Parkinson, vice-president of Infotel Systems, Corp. in B.C., Canada, said. "It's addressed at the operating system level."

Like Hyperchannel, CDC's Loosely Coupled Network allows mainframes to share tape drives and disk drives, but at a somewhat lower speed of 36M bit/sec.

"The people who designed the Hyperchannel had worked here at CDC," according to Ernest Larson, who is CDC's product marketing manager.

According to Philip Enslow, professor of information and computer sciences at the Georgia Institute of Technology in Atlanta, these networks are "used to move files from one place to the other on the mainframe and are very much back-end networks."

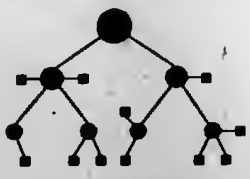
IBM's protocol Systems Network Architecture "is primarily a front-end solution," Enslow said.

If these networks can do at the mainframe level what smaller networks cannot do at the lower level, why aren't most users opting for the big boys? According to Kim Myhre, manager of communications research at International Data Corp., it is a question of high prices. The price tags on these networks can run anywhere from $40,000 to as high as $100,000.

While price cuts of up to 35% have been predicted for these networks, the price tags still remain high. Despite this, "it's a growth market because mainframes are a growth market, and there are a lot of multivendor shops out there," John King of James Martin Associates of Carmel, Calif., said.

In addition to high cost, only extremely large shops could make good use of these networks and the cables that are more than an inch thick and cost $30 per foot. "They are monsters," Parkinson pointed out. "They are as stiff as the conduits" into which the cables usually fit.

And while these networks are impressive, they cannot supplant the low-end local-area networks: They can only work with them.



Hierarchical Topology

Bus Topology

Special Section: Local Area Networks

THE TOKEN RING

By David Potter

One of the oldest forms of local network topology is the ring, a physical sequence of stations that closes on itself. The original form has been extended to several important variants. The ring has been studied extensively and implemented both as a research vehicle and in commercial products. The Institute of Electrical and Electronics Engineers (IEEE) 802 Local Network ▶

Potter is founder and vice-president for research and advanced development, Interlan, Inc., Westford, Mass.

Standards Committee has written a draft of a standard for ring topology, token-access local-area networks. As of this writing, that draft standard is on its way through the approval process that will result in it becoming an IEEE standard. It has been endorsed, wholly or in principle, by several companies, including IBM.

Now that the 802 ring is emerging from the laboratory into the harsh light of commercial development, it is important to review the capabilities of the ring that appears to have the most chance of widespread use. The token-passing, ring topology local network is is now available in several forms and promises to be significantly more visible in the future.

Ring topologies, as their name implies, consist of physical sequences of equipment. The simplest of these has the form of a single ring, as shown in Figure 1. In the course of installing and maintaining such a connection, it may be necessary to route connections in accordance with immediate needs rather than in the shortest path. This may result in the pattern shown in Figure 2. The connections also form a ring, but one that is hard to see because of the wiring runs. The wire center was designed to overcome this sort of headache and will be examined in more detail below. Variations of the basic ring topology have been proposed and, in some cases, built to improve reliability or performance.

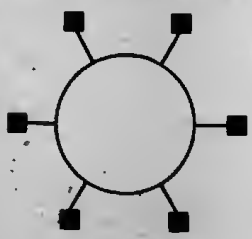


Figure 1. Single Ring

The use of a ring topology network involves sending data traffic from one station to the next station in the sequence. This traffic may have originated with the first station or may have been received from another station. The process of receive and retransmit continues until the data packet arrives at the station to which it is addressed. That station copies the packet into a memory buffer, marks it as received and retransmits it to the next station.

Eventually, the packet is received by the station where it originated, which removes it from the ring. The time required for a packet to travel completely around the ring is called the walk time. Ring networks have a 1-bit delay in each station. The total of the 1-bit delays and the propagation delay in the cables determines the minimum walk time. The walk time may be made longer by additional delay in one or more stations. This would be done to ensure a minimum value that allows one complete token frame to circulate.

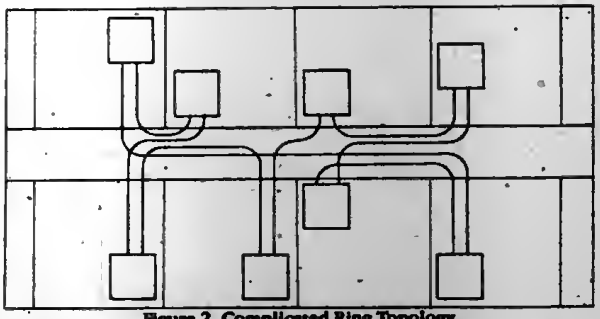


Figure 2. Complicated Ring Topology

There are several approaches to managing the right to transmit a packet on the ring. In the most common approach, a packet is marked as "in use" by the state of one of the leading bits in a section called a token. If a station has a packet that it must send, it waits, monitoring the traffic on the ring, until it detects a token that is marked as "available for use." It then sets the bit in the token to its "busy" state and appends its message. It must transmit at the proper clock rate so that its message does not get out of synchronization with the receiving stations's clock.

It may send a long packet, since the packet is removed again at the sending station. At the end of the

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packet, a frame check sequence allows the receiving station to verify the accuracy of what it received. That station may then assert a bit at the end of the packet signal indicating that it has received the packet correctly. The transmitting station would monitor the end of the packet (perhaps testing the frame check sequence to verify a proper operation of the ring) to see if the intended receiver was able to copy the packet. If not, the packet could be sent again. This type of ring is called a token ring.

Another token-based access method involves having several tokens on the ring simultaneously. This is accomplished by dividing a specific walk time, which may be achieved by delays in the stations, into slots. Each slot can accomodate one small packet of fixed size, and each slot has its own token at the beginning. This is called a slotted ring.

There is also a type of ring that uses a contention-access protocol. It is similar to the Xerox Corp. Ethernet in its access rules. A station with traffic to send must defer if there is an active packet being sent, but may transmit immediately if no other station can be heard. Just as in any contention-access method, there is the possibility of a collision.

It is necessary for the transmitting stations to compare what comes back around the ring for at least one walk to detect collisions. When the station finishes sending its packet, it appends a token to the end of its transmission. Another station that has been waiting to send its traffic can seize the token, mark it as "in use" and send without danger of colliding. The contention ring thus acts as a token ring under moderate to heavy use and like an Ethernet under a light load.

The final type of ring is not based on token-access rules, but on register insertion. In this form, a station with traffic to send will insert that packet at the end of some other station's packet while storing incoming traffic in a buffer memory. After sending its packet, the station sends the traffic that has accumulated in the buffer and resumes listening.

The rat's nest of Figure 2 (on Page 46) illustrates one of the practical difficulties that characterize ring topology networks. It can be very difficult to manage the physical wiring of a ring-connected local-area network. It is also difficult to install or remove a station from the ring without a significant loss of service to the other stations. These considerations can be tolerated, as the number of ring networks in use can testify, but a better approach is needed.

The wire center is an attempt to overcome the physical inconvenience of the ring topology. A wire center is a common location at which connections and bypass relays are located, usually in a compact box, and to which all stations run a pair of cables. The cables form the ring sequence through the connectors of the wire center. Wire centers may be interconnected to form extended rings up to the physical limit of the ring.

By use of strategically located wire centers, a ring topology installation will be significantly simplified. The problem of which stations to cable to is reduced to finding a free connector pair on a wire center. The interruption in service when connecting a new station into the ring will be reduced to the time required for a relay to open. A packet may be lost. Congestion at a wire center can by relieved by simply installing a new wire center nearby and connecting it to the one that is out of connectors. Figure 3 (on Page 50) illustrates a cascade of wire centers. The interconnection of wire centers can extend the physical ring boundaries to a large area while keeping the management of the physical plant a reasonable task.

The rules that determine access to a shared resource are critical determinants of the properties and performance of a network. A local network usually has a physical channel as

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its lowest level of shared resource. The access rules that determine which station may use the ring have already been mentioned, being either token or contention or buffer insertion. It is helpful to examine the token-access ring in detail since it is being standardized by IEEE-802.

It is important to recognize the difference between token passing on a bus, such as the IEEE-802.4 protocol, and token access on a ring. A logical sequence is created on a physical bus, and the token is an explicit message that must pass from one station to the next for each station in the sequence. The overhead — which is not usually much — for each station to receive and retransmit the message is always present on a token bus.

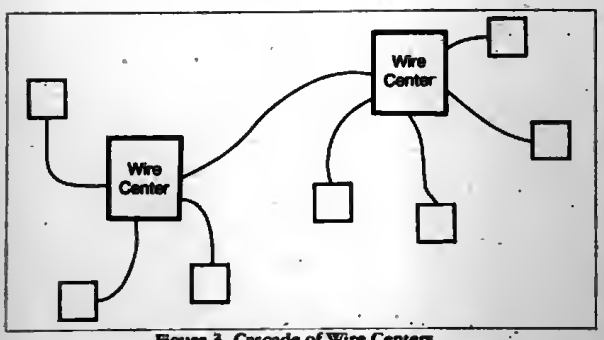


Figure 3. Cascade of Wire Centers

On a ring, the token is associated with a circulating packet and can be ignored by stations with no traffic to send. It might have been desirable to have had different terms to describe the two types of tokens, but the usage appears to be embedded by this time.

The use of the token on a ring as a means for access control occurs as follows. A station on the ring with a packet to send will monitor the data it detects passing on the ring until a sequence that it recognizes as a token appears. It converts the token to a connector, usually by inverting one bit. It sends its packet, concatenated with the connector, to another station on the ring. The station listens for the connector to come back around and converts it back into a token. The next station with traffic to send that recognizes the token may send its packet.

The station that sent the packet has no way of knowing if it was received correctly unless it can check what comes back around the ring for a correct frame check sequence and acknowledgment from receiving station that the packet was copied. The IEEE-802.5 standard explicitly provides an acknowledgement field at the end of the packet that the receiving station must modify as it retransmits the packet.

One bit indicates that the packet was or was not received with correct frame check sequence. A second bit indicates that the receiving station did or did not have a buffer available in which to store the packet. Thus, the sending station would know whether or not to retransmit the packet.

The station that is sending the packet could have a second packet to send already in the queue when it sent the first one. It could simply leave the token bit asserted and transmit the second packet immediately and a third frame and so on until the queue is empty. This mode of operation is called exhaustive transmission. It has the advantage to the sending station that very high throughput can be sustained once the token has been seized.

It has the disadvantage to the rest of the stations that an indeterminate time may elapse before the first station exhausts whatever process is supplying packets and passes the token. The IEEE-802.5 standard allows the transmission of multiple packets.

The IEEE-802 Local Network Standards Committee has drafted a standard for local-area networks that incorporates several different approaches to topology and access control. These approaches include carrier-sense multiple access with collision detection on a baseband bus (Ethernet), a token-passing bus that can be employed on either a baseband or broadband bus and a token ring definition. The latter, incorporated in section 802.5 of the standard, is widely regarded as IBM's choice. This is due to the fact that the IBM contributions to the work of the committee dominate the 802.5 definition, and IBM has publicly supported the token ring as a local network form. However, IBM has not announced any products that include the 802.5 ring, and the firm's spokesmen have refused to state any commitment to it. Time will tell. ■

Special section: Local-area networks

CHARTING THE WATERS

By Michael J. Zak

In recent years, many local-area network products have appeared. Vendors have promoted these products based on the performance benefits available from local-area network technology. Typical customers have been early adopters, tending to be technically adept and appreciative of the performance benefits that are inherent in local-area network technology. ▶

Zak is director of market planning, Network Control Products Division, Codex Corp., Mansfield, Mass.

At the same time, a great deal of confusing activity has occurred among standards bodies. Debates have raged over the peculiarities of one access method vs. another or one transmission media vs. another. In addition, many questions have arisen. Which access method is best — carrier sense multiple access with collision detection (CSMA/CD) or token passing? Should a local-area network system employ a broadband cable plant or should the system use baseband techniques?

Vendors, early adopters and standards bodies have focused on the above issues, and as a result, discussion has been drawn away from critical issues that will determine whether or not local-area networks are accepted by users. Local-area networks must be shown to solve real-world user problems in order for their user base to grow.

There is hope for potential local net users who are trying to find a way out of the confusion reigning in the market. Network selection can be made much easier by doing some preparation before meeting with vendors.

A LONG, DRAWN EXPLANATION OF THE DCA

THERE IS HOPE for potential local-area network users who are trying to find a way out of the confusion reigning in the market. Network selection can be made much easier by doing some preparation before meeting with vendors that have vested interests in specific technologies.

In this preparation, the user's objective should be to understand the scope of the problem he wants to solve and to use those boundary conditions in dealing with vendors. Because users often need to solve a current problem with a solution that has the flexibility to respond to growth and change in the user environment, an effort should be made to define today's problem and to predict tomorrow's problem.

Two types of problems tend to crop up in local data communications. The first type of problem can be labeled physical and includes such specific difficulties as:

- The need to provide connectivity so users can gain access to multiple applications from a single display terminal;
- The proliferation of cabling and the resultant space and cable labeling problems, which are especially relevant in user environments where terminals are moved often;
- The limitations on terminal and CPU driving distances and the need to incur additional costs to extend driving distances;
- The need for increased transmission speeds in order to handle applications that require high speeds, such as peripheral sharing and communications via transferring of files;
- The interconnecton of geographically dispersed local-area networks via wide-area network facilities;
- The management of the physical inventory, maintenance and financial status of equipment within the local-area network;
- The need to perform troubleshooting and diagnostics on the physical components of the local-area net.

The preceding list includes the most basic problems that a data network manager who has significant local data communications responsibilities must confront. Even though these problems are quite common, there are few easy solutions.

In the synchronous world of IBM and IBM-compatible cluster controllers and display heads, there remains the requirement to lay in separate runs of coaxial cable for each display head.

In the world of asynchronous communications typical of minicomputers, dumb and smart terminals, the data private branch exchange (PBX) offers a reprieve from some of the problems usual above. If local data communications problems were exclusively physical and if data communications consisted solely of asynchronous communications between Ascii terminals and minicomputers, the data PBX might be an adequate solution to the local-area net problem.

Logical problems come to the fore after the network manager has solved the physical problems. While physical problems aggravate the network manager, the logical problem usually afflicts the network user.

The second problem that afflicts data network managers can be called a logical problem. Logical problems come to the fore after the network manager has solved the physical problems. While physical problems aggravate the network manager, the logical problem usually afflicts the network user. Specific examples of logical problems are:

- How can a user, employing terminal equipment and applications that are unique to a given vendor's proprietary architecture, gain access to applications and data bases that are unique to another vendor's proprietary architecture?
- How can network availability be guaranteed?
- How can system loading and system capacity be managed to ensure minimum response times?

A local-area network problem is complex and hard to define. Physical problems tend to be evident today, but the logical problems are just beginning to emerge. The essence of the buyer's challenge is to define today's physical problem, outline tomorrow's logical problem and then choose a vendor that solves today's problem.

A few hints are helpful for users engaged in problem definition. First, avoid the jargon that has afflicted the local-area network industry. Do not express a requirement for Xerox Corp.'s Ethernet or a broadband system because of all the bandwidth it will handle. Instead, define your application and force the vendor to do his job — to demonstrate to you that his product solves your problem.

Finally, do not hesitate to call in one or two vendors to use their applications engineering expertise to help solve the problem. Using vendor expertise in the early stages of problem definition is a low-risk way to gain valuable insight into a vendor's commitment and capabilities in the local-area network business.

In searching for a vendor, establish priority problems for the local-area network system to solve.

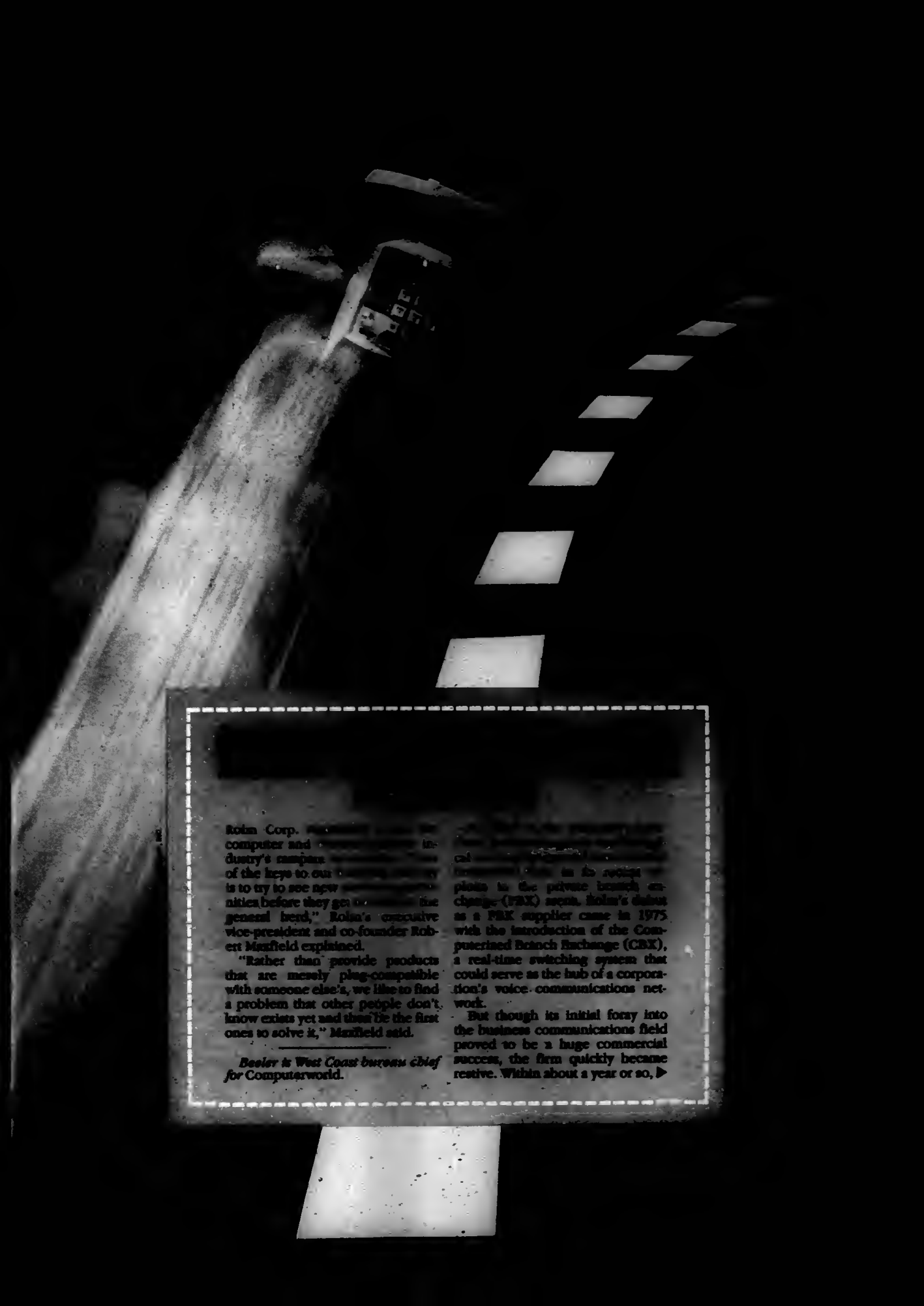
The failure to establish priorities for product capabilities, thereby stating an implicit unwillingness to compromise, suggests that the only viable course for a user is to contract a custom local-area network, with its attendant costs and the difficulties of supporting nonstandard products.

The required local-area network solution can be outlined in many ways. Once the user makes the distinction between physical and logical problems, he can relate the two generic problems to his applications environment. For example, a network manager might legitimately consider a local-area network because he has a lack of space for additional cabling to support terminal-to-CPU traffic. This physical problem might dictate a fundamentally different solution than that required for a logical problem such as resolving protocol incompatibility.

In evaluating solutions for local data communications problems, the network manager should assess speed and performance, flexibility, security and cost. These items should be included in a statement detailing the problems a vendor is required to solve.

Having prepared a definition of the local communications problem, the user then proceeds to evaluate the alternatives available for solving the problem. This evaluation should entail far more than a review of products. It should also include an evaluation of the vendors that provide the products.

Astute users will assess a vendor's motivation for being in the local-area network business. If the vendor's traditional business has been the sale of CPUs, does the local-area network offer communications services to hardware manufactured by other vendors? Often, local-area networks offered by CPU vendors support only the proprietary communications architectures of that vendor. In the ideal case, the local-area network vendor should be motivated by a desire to solve the general communications problems of the user. It is critical for the vendor to show that he solves today's problems with his current product and that he has a strategy that will address tomorrow's problems. ■



Rolm Corp. [redacted] computer and [redacted] industry's rampant [redacted] of the keys to our [redacted] is to try to see new [redacted] nities before they get [redacted] the general herd," Rolm's executive vice-president and co-founder Robert Maxfield explained.

"Rather than provide products that are merely plug-compatible with someone else's, we like to find a problem that other people don't know exists yet and then be the first ones to solve it," Maxfield said.

Beeler is West Coast bureau chief for Computerworld.

[redacted] cal [redacted] in its recent [redacted] plants in the private branch exchange (PBX) arena. Rolm's debut as a PBX supplier came in 1975 with the introduction of the Computerized Branch Exchange (CBX), a real-time switching system that could serve as the hub of a corporation's voice communications network.

But though its initial foray into the business communications field proved to be a huge commercial success, the firm quickly became restive. Within about a year or so, ▶

Rolm's executives and engineers were already hankering to exploit their newly won market advantage by enhancing their existing PBX to support data as well as voice communications.

The aim behind the suggested product upgrade was to address the then-emerging problem of how to enable the business world's growing hodgepodge of incompatible terminals and other data devices to communicate with each other. Rolm's proposed solution was to centralize all the necessary protocol conversion and other data-switching capabilities in a customer's PBX and then allow users to contend for communications resources. Such an arrangement, the company reasoned, would minimize transmission costs through resource sharing, allow data to be exchanged over existing telephone cables and provide computerized office equipment with the same level of universal connectivity that had long characterized telephony.

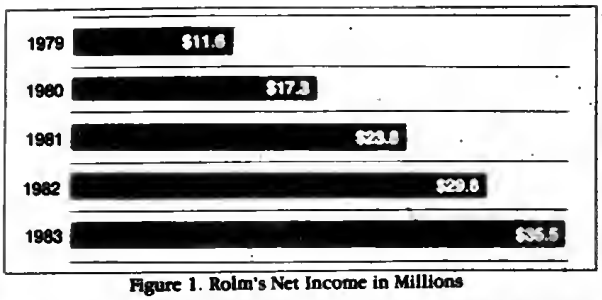


Figure 1. Rolm's Net Income in Millions

At the moment of its conception, the notion of combining voice- and data-switching capabilities in a single box proved to be about five years ahead of its time — a fact that forced Rolm to postpone the announcement of its enhanced CBX. By early 1981, the problem of interconnecting diverse models of office equipment had received enough widespread user attention to convince Rolm that its integrated voice and data PBX was finally ready for formal introduction.

But even though the product's release was significantly delayed, the company still ranked among the first PBX vendors to add data communications support to its existing real-time voice capabilities. Only archcompetitor Northern Telecom, Inc. rivaled Rolm for the honor of perfecting the industry's first combined voice and data switching system, Maxfield recalled.

Since then, Rolm has substantially broadened the scope of its communications business to encompass many of the desktop data devices and applications that a central switching system supports. Some of those data communications accessories and software packages include Cypress, a combination display terminal and digital telephone, and Phone Mail, a computerized system that takes, forwards and distributes messages.

Rolm's long-standing participation in the integrated voice and data switching market and its subsequent expansion into the automated office equipment field graphically illustrate one of the key tenets of the company's guiding management philosophy: Commercial success lies in carefully identifying selected business opportunities and then doggedly pursuing those target markets through good times and bad.

Unlike some of its main rivals, whose business interests span nearly the full spectrum of communications products and services, Rolm deliberately restricts its focus to just one narrowly defined specialty — business communications. "We have consciously avoided participating in the central office and carrier equipment field," marketing vice-president Richard Moley said. "Nor are we interested in making stand-alone kinds of office products that exist outside the context of PBX systems. We would obviously be foolish at this late date to try to compete in stand-alone word processing with companies like Wang [Laboratories, Inc.], which is already well-entrenched in that field."

Rolm's strong emphasis on business communications is reflected in the breakdowns in the company's latest sales figures. Only about nine years after its debut in the voice communications arena, PBX and office accessories sales already account for roughly 85% of the firm's total revenues. The balance of Rolm's business comes from the sale of ruggedized military computers, the products that gave Rolm its corporate start.

The combination of judicious market selection, strict adherence to a preset business course and a corporate culture that stresses

technological trailblazing rather than copycatting has stood Rolm in remarkably good stead. Between 1979 and 1982, the company's combined revenues more than tripled from $121 million to $380.6 million. In 1983, sales rose an additional 32% to top the half-billion-dollar mark for the first time in the corporation's history, and for the first six months of fiscal 1984, revenues jumped again to $288 million. In addition, the firm's impressive net income and shareholders' equity figures are shown in Figures 1 and 2.

Rolm's steadily expanding sales mirror its growing participation in the PBX field, where the company currently holds an estimated 15% market share, second only to industry behemoth AT&T. The smaller of the two firms also claims to control possibly the largest installed base of data-switching products in the U.S.

In fact, the vendor's latest commercial ventures have proven so successful that they recently attracted the notice of none other than IBM, which last summer bought 15% of Rolm's common stock and since then has acquired an additional 5%. Under the minority-purchase agreement, IBM can exercise its option to boost its interest in the business communications company to a maximum of 30%.

For Rolm, the benefits of the newfound relationship with Big Blue are manifold. For one thing, the partnership seems almost certain to ensure a high level of connectability among IBM's future hardware modules and Rolm's PBXs, Maxfield predicted. In addition, the accord is expected to promote the development of widely accepted interfacing standards that may eventually enable a broad assortment of competing data devices to communicate with each other.

A second major advantage of the IBM-Rolm union is that it significantly enhances the communications company's presence in markets abroad, Maxfield said. At present, international sales account for only about 5% of the firm's overall annual revenues. Except for an installed base consisting of 25 to 30 PBXs in Japan, Rolm's penetration of the potentially lucrative foreign market is restricted to a relatively modest number of customer sites in Italy, Latin America and Korea. The supplier also boasts a joint venture in Mexico.

In the future, however, Rolm expects an increasingly hefty percentage of its total voice and data communications business to come from overseas. "We definitely have ambitions to be a worldwide supplier," Moley said.

IBM's minority position in Rolm is further expected to benefit the smaller firm by substantially magnifying its credibility in the eyes of current and prospective customers, especially large national accounts. Until recently, when major U.S. corporations were pondering the acquisition of a centralized voice- or data-switching system, Rolm often

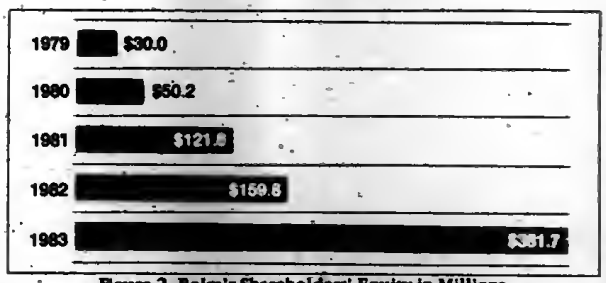


Figure 2. Rolm's Shareholders' Equity in Millions

fared badly in comparison to established communications giants like AT&T, Northern Telecom and the large Japanese manufacturers. The problem had less to do with shortcomings in the company's products than with serious misgivings about the long-term viability of the vendor itself.

"As you move higher and higher into customer organizations, the issue of vendor survivability becomes increasingly important," according to Bill Warren, a product manager responsible for the telephone and voice-switching side of Rolm's telecommunications business. "So even though we currently have annual revenues exceeding $500 million, we still may look relatively paltry compared to AT&T and the Japanese."

But now, in the wake of Rolm's newly forged alliance with IBM, doubts about the communications company's market staying power are rapidly disappearing.

"Suddenly, [the association with IBM] has made us the safe buy, particularly in view of the recent Bell breakup" and its resulting industry disarray, Janice Carnes, a product manager for the

data-switching side of Rolm's operations, maintained.

FOUNDED IN 1969, Rolm derives its unusual moniker from the first letters of the last names of its four co-founders — Gene Richardson, Ken Oshman, Walter Loewenstern and Maxfield, all graduates of Rice University. For roughly the first six years of its corporate existence, the company devoted its energies exclusively to manufacturing and selling military-oriented computers capable of withstanding severe temperatures and other hostile operating conditions.

In 1975, the firm entered the second phase of its organizational evolution when it diversified its product line with the introduction of the CBX. Since then, Rolm has steadily broadened its switching systems line to include a wide assortment of additional CBXs, ranging from very small to very large models. Last November, the company further enhanced its PBX family with the announcement of its CBX II, a second-generation digital communications system.

Today, Rolm consists of two main business entities — the Mil-Spec Computer Division, which supplies the ruggedized military computers, and the Business Communications Division, which came into existence with the advent of the firm's first PBX. The Business Communications Division, in turn, embraces two main product disciplines: telecommunications and automated office systems.

Unlike the telecommunications group, which specializes in providing PBXs and digital as well as analog telephones, the office equipment organization focuses on the development of applications and desktop data devices that complement the corporation's switching system technology.

Within the Business Communications Division also lie two of Rolm's other major commercial operations — its international telecommunications and industry systems groups. The international telecommunications organization concentrates primarily on tailoring the company's U.S.-made PBXs to foreign specifications and then selling the products to customers abroad. The industry systems group, meanwhile, aims to maximize the firm's penetration in selected end-user markets like health care and hotel management.

Rolm currently employs about 7,600 people, more than 3,000 of which are ensconced in the fountain-studded, garden-like setting of the company's Santa Clara, Calif., international headquarters complex.

As Rolm's work force and the extent of its commercial activities have steadily expanded during the past 15 years, many of the company's methods of doing business have slowly, but profoundly changed.

Only three or four years ago, "customers looked on PBXs as just another utility," Warren recalled. "Buying a PBX was like ordering a coffee pot." The result was that PBXs were typically bought by telephony managers, who usually based their product selections on one simple criterion — line costs.

But today, the picture is rapidly changing. With PBXs increasingly being regarded as components of a user organization's overall information system, Rolm is selling a growing number of its products to management information systems directors and vice-presidents of finance rather than to telephony managers.

That shift in the composition of its customer population, in turn, is forcing the firm to revise its selling tactics to stress expandability features and functions instead of costs per line.

Within large corporations, PBX buying decisions are fast acquiring the same degree of strategic significance as the acquisition of a central mainframe — a development that has prompted Rolm to upgrade its sales pitches accordingly, Carnes said.

LOOKING AHEAD TO the future, Maxfield foresees a continuation of his firm's past business successes, but is wary of of the potential dangers of managing rapid corporate growth. "Our strategies, opportunities and current market positions are winners," he said. "But no matter how good they are, all our plans still have to be implemented, which is always a challenge.

"And implementation ultimately boils down to people and to our ability to manage them effectively and develop them professionally," he added.

To a limited extent at least, Rolm's long-term financial outlook also hinges on future directions within AT&T, its prime competitor. If the newly-divested communications giant elects to cross-subsidize the unregulated part of its business with revenues from its long-line monopoly, Rolm and other PBX suppliers may find themselves hard-pressed to compete, Moley said.

But in the absence of such unfair business practices, the company expresses confidence in its ability to continue meeting AT&T's formidable market challenge. "The office automation and computer business is highly dynamic and is an environment where you have to be very fast on your feet to survive," Moley said. "We're accustomed to competing in that kind of environment. AT&T, on the other hand, is a huge company where the top management is utility-oriented and is used to an environment where your investment lasts a long time and yields a guaranteed return." ■

WORKSTATION

A new type of workstation is emerging that [illegible] personal [illegible] assistant' [illegible] The [illegible] offers blended [illegible] personal [illegible] in a machine. [illegible] communications. Examples of [illegible] computerphones include Northern Telecom, Inc.'s Displayphone; [illegible] Corp.'s Cypress; Cygnet Technologies Corp.'s Cosystem; and Zaisan's ES.1. By year-end 1988, 1½ to two million computerphones could be installed in the U.S.

The computerphone's major thrust is toward access above all other functions. This distinguishes it from the applications-oriented personal computers. The computerphone's networking specialization makes it suitable for the daily activity of higher

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Colony is president, Forrester Research, Inc., Cambridge, Mass.

[illegible] moving into a new era, [illegible] next-generation private branch [illegible] (PBX) pushing a range [illegible] features out to the telephone instrument. These PBXs — for [illegible] Rolm's CBX II; Ztel, Inc.'s [illegible] and CXC Corp.'s Rose — promise to switch data in addition to voice, radically altering the telephone's [illegible] role. They will also dispense applications to user workstations including data base and other executive functions.

These two factors — managerial and executive focus in communications and the coming of high-tech telephony — are expected to [illegible] computerphone market over the next three years.

Several elements are basic to a computerphone's function. [illegible] is telephone capability, [illegible] ported, [illegible] from screen and [illegible] vanced telephone functions. [illegible] computerphones are equivalent [illegible] full-feature electronic telephones [illegible] are capable of plugging into any analog PBX line. In the future, computerphones will be closely linked with third- and fourth-generation [illegible] PBXs and will be able to exchange data and voice using the switches' proprietary digital signaling techniques.

The computerphone includes two keyboards — a function key dashboard and a standard alphanumeric keyboard. In addition, it includes a CRT and enough intelligence and memory to compose and store directories and short messages.

Workstation Telephones

The computerphone market can be divided into three segments. These are:

- *PBX proprietary computerphones*, which are designed to hang off a specific PBX;
- *Stand-alone computerphones*, which can attach to any telephone line or PBX;
- *Personal computer add-ons*, with the computerphone function added to a personal computer.

The PBX proprietary computerphone is sold as part of a complete telephone system. Examples include Rolm's Cypress and Northern Telecom's SL-1 Displayphone. These machines are differentiated from the stand-alone computerphone in that they are protocol- and software-compatible with a specific PBX. Three types of protocols apply: voice signaling, data signaling and feature access.

Advanced PBX computerphones have several distinguishing features. They offer one wire set connectivity. One twisted pair carries interleaved voice and data between the PBX and the computerphone. They also support high-speed communications. PBX computerphones signal to the PBX at 56K or 64K bit/sec. In the future, speeds in the 1M bit/sec range will be supported. In addition, these PBX propriety units offer easy access to a broad range of telephone functions.

Rolm, AT&T Information Systems, Northern Telecom and Mitel Corp. are the budding players in the PBX computerphone segment of the market. Rolm and Northern Telecom perceive the computerphone to be an important future business. Rolm estimates that Cypress I and Cypress II, which is still unannounced, could generate between $35 million and $50 million in revenues in 1985 and double that amount in 1986. AT&T Information Systems may position the business communications terminal as a personal computer alternative in 1984.

One major disadvantage of the PBX computerphone is its all-or-nothing implementation. Users must install specific types of PBXs to run the PBX computerphones. This makes the PBX computerphone tough to pilot — an important evaluation method used by large companies.

Vendors Year-end 1983	Potential Vendors Year-end 1985	Potential Vendors Year-end 1988
Rolm Corp.	IBM	Regional operating co.
AT&T Information Systems	Wang Laboratories, Inc.	Digital Equipment Corp.
Northern Telecom, Inc.	Ztel, Inc.	Hewlett-Packard Co.
Mitel Corp.	Ericsson,Inc.	
	CXC Corp.	
	Lexar Corp.	
	NEC America, Inc.	
	GTE Corp.	
	Harris Corp.	
	Siemens Corp.	
	Hitachi Ltd.	
	Intecom, Inc.	
	TIE Communications, Inc.	

Source: Forrester Research

Figure 1. Outlook for PBX Proprietary Units

THE SECOND TYPE OF computerphone, the stand-alone unit, can attach to any analog telephone line — PBX, Centrex, keyset or single-line. Important stand-alone machines include Northern Telecom's Displayphone, Zaisan's ES.1, Mitel's Kontact workstation and Ambi Corp.'s Ambiset.

An important distinction between the stand-alone computerphone and the PBX computerphone is the level of telephone function supported. The PBX computerphone will be attached to one digital line in the future, and it will be software- and function-compatible with the PBX. For example, when the call-forwarding button is pushed, the PBX computerphone will interact with the PBX's call-forwarding software using a specialized digital management protocol. The stand-alone computerphone can access some PBX functions using dual-tone multifrequency and flash, which is quick switch-hook depression.

The primary advantage of the stand-alone unit is its ability to fit into any office environment regardless of the level of telephone service offered. About 97% of telephone lines installed in the U.S. at year-end 1983 were analog, a large universe of potential installations for stand-alone computerphones.

Looking ahead to 1988, there will still be an extremely large universe of nonproprietary telephone lines, representing the potential market for stand-alone computerphones.

A THIRD TYPE OF computerphone that is closely linked with personal computers has emerged. This group includes Cygnet's Cosystem, which adds computerphone functions to the IBM Personal Computer. The major appeal of the personal computer add-on unit lies in its ease of implementation. No corporate workstation standards are violated by this type of machine. And with the add-on unit, users do not have to learn new interfaces, keyboards or routines.

In addition, this type of computerphone builds off the already accepted personal computer; no major internal selling program is necessary.

Vendors Year-end 1983	Potential Vendors Year-end 1984	Potential Vendors Year-end 1985
Mitel Corp.	IBM	Apple Computer, Inc.
Northern Telecom	Wang Laboratories, Inc.	Tandy Corp.
Zelsen	Digital Equipment Corp.	
Davox Communications Corp.	Display Telecom Corp.	
GTE Corp.	NEC America, Inc.	
Suva Corp.	Televideo Systems, Inc.	
Scott-Thompson Corp.		
Sydis, Inc.		
Digital Transactions, Inc.		
Tymnet, Inc.		

Source: Forrester Research

Figure 2. Outlook for Stand-Alone Units

In preparation for a recent report on computerphones, Forrester Research, Inc., a research firm based in Cambridge, Mass., surveyed office automation and management information systems planners within 25 Fortune 1,000 companies. Few of the users had computerphones installed in their companies. However, the concept excited respondents. A typical comment was: "The computerphone will be the way we take automation to vice-presidents and general managers. That level of personnel doesn't want clunky personal computers with spreadsheets."

While the general idea of telephony automation made sense, real application of the machines was difficult for users to envision. One respondent stated this ambiguity well: "Before we begin to install the computerphone, I don't think we can know how we'll use it."

Much of the sample saw the computerphone as a means of communicating with internal and external data bases. The respondents mentioned sales records, IBM's professional office system, decision support systems, electronic messaging systems, Digital Equipment Corp.'s Datatsieve and Wang Laboratories, Inc.'s Alliance, among others.

Other results of the survey are listed below:

- Telecommunications management within the companies is expected to oversee computerphone purchase and installation. This reflects the machine's close association with the PBX.
- The computerphone must be relatively inexpensive. Most users believed that it should cost between $700 and $900.
- Personal computers and computerphones must be linked. The capability to move messages, spreadsheets and other information between personal computers and computerphones was important.
- Users expect to install large numbers of computerphones over the next five years. The average number of telephone lines with computerphones was expected to be approximately 35% of all installed telephone lines by 1988.
- The computerphone was seen as a replacement system. Survey respondents saw the computerphone as a means for replacing several diverse terminal types. These types include telephones, Ascii asynchronous terminals, IBM 3270-type terminals and personal computers. This multifunctionality will be an important means of cost justifying the computerphone.

To date, the computerphone has posed little threat to the personal computer. At year-end 1983, there were approximately 15,000 computerphones installed in the U.S.

Of that number, 10,000 were Northern Telecom Displayphones, 1,200 were Davox Communications Corp.'s Desksets, 1,000 were Mitel Kontacts, 1,500 were GTE Corp.'s or Tymnet, Inc.'s Action Stations and 1,200 were others. Shipments will increase modestly in 1984, with approximately 20,000 placed in the U.S. Of these, 65% will be stand-alone models, which is a reflection of the paucity of third-generation, fully digital PBXs.

The inflection point in the

computerphone market is expected to come in the 1985 to 1986 time frame. In that period, Rolm, AT&T Information Systems, Northern Telecom and Mitel will be heavily marketing the computerphone. A number of new challengers may have entered the market including IBM, Wang, Hewlett-Packard Co., NEC America, Inc., Hitachi Ltd. and DEC. The computerphone will be a market requirement for PBX vendors, drawing in Ztel, Intecom, Inc. and other switch makers.

By year-end 1986, 600,000 machines will be installed. The population could grow to between 1.8 million to two million by 1988. This represents a penetration of 4% to 6% PBX and Centrex lines.

Stand-alone computerphones will lead the market through 1987. This reflects the limited availability of digital third- and fourth-generation PBX lines. But PBX computerphones will overtake stand-alone models and grow to dominate the market by year-end 1988 (see Figures 1 and 2). This begemony will derive from the close linking of the computerphone and advanced PBX functions such as messaging and protocol and applications bridging.

In addition, personal computer add-on units will experience steady growth through 1988. By year-end 1988, 460,000 personal computer add-ons, or 2.3% of total U.S. personal computer installations, will be installed (see Figure 3). By year-end 1988, 60% of computerphones will be attached to proprietary PBX lines, and 40% will be attached to nonproprietary dual-tone multifrequency lines.

Without applications and PBX links, the computerphone is little more than an expensive autodialer and semi-intelligent terminal. There will never be a demand for computerphones that lack links to higher level systems. Northern Telecom expected to sell 100,000 stand-alone Displayphones in its first year of shipments, but only 10,000 have been shipped to date. Their efforts were continually plagued by the user query, "But what do I do with it?"

Vendors Year-end 1983	Potential Vendors Year-end 1985	Potential Vendors Year-end 1988
Cygnet Technologies Corp.	Apple Computer, Inc.	Personal computer vendors
Display Telecom	Tandy Corp.	
Davox Communications Corp.	AT&T Information Systems	
Digital Equipment Corp.	IBM	
Wang Laboratories, Inc.	Convergent Technologies, Inc.	
Grid Systems Corp.	NBI, Inc.	
Televideo Systems, Inc.	Exxon Corp.	
	CPT Corp.	

Source: Forrester Research

Figure 3. Outlook for Personal Computer Add-Ons

THE CREATION OF the computerphone market will hinge on two factors: first, finding a niche function within user organizations and proliferating from that entry point; and second, creating usable communications applications such as data base, videotex, professional computer synergy, messaging and telephony automation.

Just as spreadsheets became the launching pad for personal computers, telemarketing could become the linchpin for the computerphone. In the first phase of the market (1983-1986), computerphones are expected to find their way into large corporations via sales departments. Vendors with experience in the market, such as Davox and Northern Telecom, indicate that their machines are being installed where there is a clear intersection of the telephone and data base functions. For example, Morgan Stanley brokers are using 300 Davox Desksets to track sales leads and access client files. Burlington Northern Air Freight uses Davox for credit collection. A large medical supplier uses 300 Displayphones for sales tracking.

Once the computerphone is installed and supported by a sales data base, it could branch out into the executive suite and onto managers' desks. This second computerphone phase (1987-1990) will center on the availability of communications applications including an easy-to-use data base, perhaps videotex; message creation, storage, retrieval and transmission; personal computer links; and advanced telephone functions.

The computerphone market is still in its infancy. Emerging technologies, such as voice I/O, digital PBXs, packet-switched interfacility links, and the recent AT&T divestiture are converging to create special conditions. These market shifts could make the computerphone the next hot workstation. ■

THE GREAT CPE SHOPPING SPREE

BY KATHERINE HAFNER

The regional operating companies, thrust into the competitive marketplace for telephone equipment, have been faced with the formidable task of buying the equipment they will resell to customers. The resulting situation is an OEM extravaganza, with communications vendors hot on the tail of seven companies that, until recently, recognized but one supplier — Western Electric.

The newly unleashed regional companies have recently signed contracts that commit them to over $1 billion in purchases of customer premises equipment over the next three years.

Hafner is staff writer for Computerworld On Communications.

Three of the big winners in the race to supply the local companies are Northern Telecom, Inc.; NEC America, Inc.; and TIE Communications, Inc., along with its Technicom International, Inc. subsidiary. TIE, a relatively low-profile manufacturer of small business telephone systems based in Shelton, Conn., has signed contracts with six of the regional companies, as well as Southern New England Telephone (Snet), which is minority-owned by AT&T.

Other vendors of telephone and switching equipment that have won contracts with the regional companies include American Telecom, Inc., ITT and Comdial Corp.

No longer constrained by an exclusive dependability on equipment from the former Western Electric, which has been renamed AT&T Technologies, the operating companies have had a field day with all the equipment available. The list of products being purchased by the local companies includes everything from single-line cordless telephones to private branch exchanges (PBX) for large businesses.

Never having been presented with such freedom of choice and by no means immune to the marketing blitzes that can plague many a consumer, the local operating companies did not have the easiest time making their purchasing decisions.

"We went for the established ▶

vendors with state-of-the-art equipment," commented Pat Hammerstrom of BellSouth Corp., the holding company for Southern Bell and Southeastern Bell. "We had to look not only at the products, but also at the kind of contract that could be worked out with the different vendors." (See the figure on Page 67 for a list of vendors and their products).

BellSouth has signed contracts with nine separate vendors sifted from an initial pile of over 100. For BellSouth, the selection process started in June 1982 and lasted a full 18 months. The result was a group of contracts ranging in duration from two to four years and totaling $200 million.

"We did a tremendous amount of testing," Hammerstrom pointed out. "We had an entire task force that did nothing but test equipment."

While loath to cite specific reasons for choosing one vendor over another, Tom Stoddard, a BellSouth spokesman, pointed out general characteristics BellSouth was looking for in its evaluation of products. "We looked at just about every factor you can think of," he said.

These included "quality, technical leadership, stability, the ability to provide enhancements and lots of internal things such as how similar the stuff was to what our people are familiar with, as well as the training and support we would receive from the manufacturer," Stoddard said.

Ameritech, the Chicago-based conglomerate of Illinois Bell, Indiana Bell, Michigan Bell, Ohio Bell and Wisconsin Telephone, went through a similarly intensive search, but in half the time. Ameritech has given its business to NEC America, TIE Communications, Ericsson, Inc. and AT&T Technologies.

"We began with a list of about 100 vendors worldwide in the spring of 1983 and narrowed it down to about 45 by the summer," Ameritech spokesman Bill Hensley pointed out.

"When we got down to the final 12, we scrutinized the products and companies. We looked at the total company from its top management on down. We reviewed software, supply capabilities, production and, of course, pricing. Then we came down to the final four."

According to Hensley, the search was absolutely thorough because "these products will form the backbone of the state-of-the-art equipment we are offering to more than a million customers in the five-state area. We are striving to be a total supplier for customers."

Despite the plethora of cutting-edge technology Ameritech can now provide its customers, the regional company plans to maintain Centrex as its flagship service offering throughout the five states, selling the equipment more as an ancillary offering.

"The equipment we are marketing is designed to make Centrex even more valuable to customers," Hensley said.

"We offer a variety of PBXs as well, for customers who want to own their own switch or are in more rural areas where we can't provide Centrex," he explained.

Where does AT&T Technologies fit into this competitive tangle? While some of the regional companies are delivering their erstwhile supplier an outright snub, others such as Ameritech

have either signed actual contracts with the AT&T appendage or have some kind of plan, however indefinite, to work the company into their overall game plan.

"For now, Western Electric doesn't fall into our highest function and highest quality list," said John Phelps, vice-president of operation for Southwestern Bell Corp., which signed up with TIE, American Telecom, ITT and Northern Telecom.

"We certainly did consider Western Electric products, and this doesn't mean we will not use their products in the future. They just did not provide the marketing flexibility we were looking for," Phelps said.

Marketing flexibility can prove pivotal in a regional operating company's decision whether or not to buy a piece of equipment. "We wanted to put our name on the products, and Western didn't go along with that," Phelps commented. "We also wanted exclusive rights to market equipment in the five-state area. The marketing flexibility was a very big factor for us.

"I've been with the Bell System for 14 years," Phelps continued. "And I was just amazed at the number of manufacturers there are out there, making everything from single-line sets to sophisticated PBXs." According to Phelps, it took the company "hundreds of hours" of evaluation before deciding on the four vendors.

TWO OTHER factors governing a regional company's decision to buy or not to buy included production capabilities and manufacturer support. "Without exception, whoever we agreed to do business with, there was outstanding support," Phelps said. "We made our determination based largely on whether we felt the manufacturer would work with us.

"And obviously," he continued, "manufacturing capabilities determined the decision as well. We projected our needed volume to be such and such, and if they couldn't produce that much, we took our business elsewhere."

The sales to the regional companies will not make an enormous difference in the annual revenues of some of the big contract winners. For others, the contracts represent a quantum leap in overall sales. TIE, for instance, whose annual sales for fiscal 1983 totaled $320 million, sees its seven contracts as "a nice piece of new business." According to a TIE spokeswoman, the contracts with the regional operating companies will generate an additional $100 million worth of business per year.

TIE refused to elaborate on the marketing strategy that has helped bolster the company's profits so markedly. NEC America also declined to comment, a silence the company claims is part of its contractual agreement with the telephone companies.

"I've been with the Bell System for 14 years," Phelps pointed out. "And I was just amazed at the number of manufacturers there are out there, making everything from single-line sets to sophisticated PBXs."

As Bell Canada's major supplier for nearly a century, Northern Telecom knew precisely how to go about winning the business of the regional companies in the U.S. "From working with Bell Canada, we've learned a tremendous amount about what transition entails and how to establish our marketing position with the Bell companies here in the U.S.," commented Lee Bauman, vice-president for Northern Telecom's distributor marketing division. "Our core involvement with Bell Canada has been our major preparation for our capability to work with the Bell companies."

Experience has taught Northern Telecom not only to stay tuned to a telephone company's requirements when negotiating a contract, but to look at the customer premises equipment market in a much broader perspective than one might ordinarily take.

"People look at [customer premises equipment] as distinct from other areas of the communications business," Bauman said. "There are many other things happening on the network side of things that have tremendous impact on the [customer premises equipment] area and vice versa. It is very valuable to a Bell company to be able to see [a supplier's] entire breadth and depth of development. That's valuable, not only for current applications, but in the longer term as well."

Conspicuously absent from the roster is Rolm Corp., the digital PBX manufacturer whose Computerized Branch Exchange switch first encroached on AT&T's turf in 1975. According to William Krepick, director of group marketing at Rolm, the Santa Clara, Calif.-based company's lack of interest in distributing its products through the regional companies has to do with its overall marketing strategy. "About 25% of our business goes through independent distributors and the rest goes through our own sales and service centers," Krepick said. "We don't pit one distributor against another. So we wouldn't even think of selling to the operating companies.

"We did not make a single phone call to any of the operating companies," Krepick added. "We have absolutely no desire to market through them because it would be 180 degrees opposed to our distribution strategy."

American Telecom, Inc.	Focus hybrid key system
AT&T Information Systems	Merlin key system
AT&T Technologies	Home phone sets, fiber-optic and copper cable, wiring
Comdial Corp.	Touch-tone telephones, self-programmable sets
Ericsson, Inc.	Prodigy digital PBX
Electra Co.	Cordless telephones
GTE Business Communications Systems	Omni Series S1 and S3, GTD 5 central office switch
ITT	Basic telephones and speed-dialing sets
Intecom, Inc.	Integrated Business Exchange PBX
NEC America, Inc.	NEAX 2400 PBX
Northern Telecom, Inc.	SL/1, SL/100, Displayphone
Technicom Communications, International, Inc.	Meritor 1E, electronic key telephone, Smart Set
	EK 416 electronic key system
Ztel, Inc.	Fourth-generation PBX

Vendors and Their Product Offerings

AND THEN THERE are Snet and Cincinnati Bell, which, by virtue of AT&T's minority ownership in the two companies, did not have to wait until Jan. 1, 1984 to enter the competitive marketplace. Cincinnati Bell, serving a 15-mile radius in the Cincinnati area and parts of Indiana and Kentucky, still relies heavily on AT&T Technologies, while Snet has gone full tilt into the open market.

"We're dedicated to a multi-source philosophy," Mike McCann, a spokesman for Snet, said. "There are so many good vendors out there and so much good technology, we feel that our customers' needs cannot be served by any one, two or three vendors."

Consequently, through its Sonecor Systems distributing arm, Snet offers products from seven separate vendors. And although it serves just the state of Connecticut for telephone service, Snet is free to market its products nationwide. With a year's head start on the other regional companies in the months preceding the divestiture, Snet announced two major products: its System 2001 office system and Lightnet, a joint venture with CSX Corp. to build a fiber-optic network throughout the Southeast.

On New Year's Day, of course, the seven regional operating companies were freed to follow Snet's example. It was simply a matter of getting equipped. ■

IRCs AND THE INTERNATIONAL CONNECTION

BY PHILIP A. TENKHOFF & JAMES C. COLLARD

For many users, planners and operators, international communications represents a major unknown. Even for corporations with extensive domestic communications networks, considerable apprehension often exists concerning the most appropriate approach to satisfy international data communications needs. International data communications to and from the U.S. has been provided by specific companies that are authorized by the Federal Communications Commission (FCC). These companies have traditionally been known as international record carriers (IRC). IRCs have an exclusive license for the transmission of records on an international basis.

Five IRCs have provided communications between foreign countries ▶

Tenkhoff and Collard are president and vice-president, respectively, of Network Communications International, Olympia, Wash.

and the U.S. for several decades. These are FTC Communications, ITT World Communications, RCA Global Communications, TRT Telecommunications Corp. and Western Union International.

Prior to the '80s, the situation was reasonably static, with the IRCs generally competing with each other to offer a well-defined range of regulated, tariffed services. The principal offerings were telex and point-to-point leased circuits.

During that period of time, the IRCs competed for market share through service, in-country presence and marketing acumen. Prices were regulated by tariffs and were, therefore, virtually identical for all IRCs, with some exceptions such as telex pricing for smaller carriers. From the user perspective, there appeared to be little or no difference between the various IRCs. A telex was a telex regardless of whether it was handled by TRT or RCA.

International Carrier — Division of Responsibility

The '80s have witnessed significant changes in international communications. The principal forces effecting change are:

- Deregulation of the U.S. telecommunications industry;
- Diversification of services provided by IRCs;
- Acquisition of some IRCs by U.S. domestic carriers;
- Changing policies of foreign telecommunications administrations;
- Availability of new technologies;
- International standards adopted by Postal Telephone and Telegraphs (PTT).

A key U.S. policy change was a 1980 FCC decision that permitted the entry of new international carriers, but not record carriers. International carriers are allowed to carry voice and data only, while record carriers may carry voice, data and other services, such as telex. This decision reversed a 1967 FCC decision, which clearly separated voice and data carriers. The role of the IRCs in providing international communications between the U.S. and foreign locations must be examined in light of this changing environment.

In order to gain a better understanding of international communications, it is important to understand the role of each of the three major entities involved in providing it. These are the IRCs, foreign PTTs and U.S. domestic carriers.

The figure above is a simplified representation of the interrelationship among the three entities. The specific case of a leased circuit is shown for illustration. However, the same principles apply for telex, packet switching and so on.

In the U.S., a domestic carrier provides service from City A to the international gateway location. The international carrier provides service between the international gateways of the U.S. and the foreign country involved. The telephone administration, usually known as the PTT in the foreign country, provides communications from that country's international gateway to the end-user location shown as City B.

With the advent of deregulation, the situation in the U.S. becomes more complex. The domestic carrier link in the figure could consist of local carriers such as U.S. West and Nynex and long-haul carriers such as AT&T and MCI Communications Corp. Conversely, the number of carriers may be less for a given situation. For example, MCI Communications Corp. now offers both domestic and international carrier service. The introduction of new international carriers, which also offer data transmission, complicates the U.S. situation. These new carriers include AT&T and Satellite Business Systems.

Even the situation with foreign PTTs is beginning to change. The UK has instituted a policy of telecommunications competition in lieu of the former monopoly. Other European PTTs are watching British developments carefully.

The important observation is that several distinct organizations are involved in providing international communications. Successful communications requires a carefully orchestrated, cooperative effort among all participating organizations.

A key result of the multiple supplier nature of international communications is that the end user must become more involved in the operational issues. The user is

the only organizational entity that has a complete sense of responsibility for end-to-end operation. While this conclusion is distasteful to many companies, it is nevertheless a fundamental axiom of international communications.

Two recent major acquisitions indicate future trends for the IRCs. Tymshare, Inc. acquired FTC Communications, and MCI acquired Western Union International. These acquisitions give MCI and Tymshare's combined domestic and international capability.

Other new providers of international telecommunications services are emerging and will compete with existing IRCs for market share. Communications Satellite Corp. (Comsat) has provided satellite capability to established IRCs since its inception. With the advent of deregulation, Comsat will likely become an international carrier and provide some services directly to end users.

By agreement with individual PTTs, AT&T has provided international voice service for many years, but has been precluded from providing certain data services. New FCC regulations permit AT&T to provide such data services. Other carriers will also try to compete for the lucrative and rapidly growing international data communications market.

THE PRINCIPAL deterrent to this expansion rests with the foreign PTTs. A common attitude is, "We have enough trouble establishing appropriate relationships with the five U.S. carriers; we have no desire to recognize any new U.S. carriers." Thus, even though the U.S. regulatory authorities will permit an expansion in the number of international carriers, the potential new carriers will encounter severe difficulty in being recognized by foreign telecommunications administrations.

The historical basis of IRC services has been leased circuits, telex and Datel. Datel is a generic dial access service used for the transmission of data on a worldwide basis. These traditional services existed relatively unimpeded and unchanged for years. However, current and projected services represent a greatly expanded version of these more familiar services.

Many enhanced services are available from the IRCs. A brief description of these services is outlined below.

- *Leased circuits.* IRCs offer point-to-point leased circuits in conjunction with U.S. domestic carriers and the PTT of the affected country. While all options are not available in all locations, some typical options for users are analog or digital; speeds of 50 bit/sec to 50K bit/sec; alternate voice and data, simultaneous voice and data and data only.
- *Telex.* Each IRC provides classic international telex services with similiar characteristics. The service is 50 bit/sec. In addition, 110 bit/sec is generally supported.
- *Computerized message switching.* This service provides for interconnection between customer networks and the public telex networks. Such systems are being used by corporations with large message volume requirements to optimize costs. Some features of computerized message switching are: I/O at speeds up to 1,200 bit/sec, Baudot and Ascii code support, message assurance provision and code translation.
- *Store-and-forward message services.* An enhancement to telex capability is the provision of store-and-forward message services by the IRCs. This service permits operators to enter all messages for subsequent retransmission and verification by the IRC.
- *Packet switching.* The IRCs, in conjunction with certain PTTs, offer packet-switching service between the U.S. and selected foreign countries. This service is interconnected and totally compatible with Tymshare's Tymnet and GTE Telenet, Inc.'s Telenet network in the U.S. It is offered both to and from the U.S. with established tariffs based on use.
- *Datel.* Datel is provided by IRCs between principal foreign countries and the U.S. This service provides for speeds up to 4,800 bit/sec (lower limits in certain countries) with charges based on use. However, most PTTs only guarantee acceptable error performance at 1,200 bit/sec, with a few at 2,400 bit/sec.

It has been our consistent observation that there is a significant gap between user expectations of services provided by the IRCs and the users' actual experiences with these services. This observation is not intended to be an indictment of the IRCs; in many cases, the IRC is constrained by the regulations and policies of the foreign PTTs.

From our experience with clients with multinational telecommunications requirements, this dichotomy between expectation and experience rests in five principal areas: support, schedules, cost, administrative complexity and availability of services.

Perhaps the most vociferous user complaint lies in the area of overall support from the IRC. Many users equate the IRC's role in international communications with the AT&T's traditional role in domestic services — that is, the IRC would assume responsibility for end-to-end service and would provide a level of support commensurate with that responsibility. In reality, the IRC cannot supply such a level of support. However, even within the sphere of responsibility of the IRC, in general, users have received a less than acceptable level of support. This includes support in planning, installation, operation and maintenance.

Those charged with the responsibility for planning and implementing international communications tend to expect installation schedules for various facilities to be comparable with similar schedules in the U.S. Experience has demonstrated the need for incorporating longer installation lead times into implementation plans.

The cost of international data communications is an issue with virtually all users. The most significant cost factor is the relatively high cost element established by the PTTs. International communications costs represent negotiated tariffs between the IRCs

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and PTTs of each country. Since the PTTs almost always represent a monopoly, there is no competition-driven incentive to keep tariffs low. Data communications planners attempt to extrapolate the experience of the U.S. to the larger sphere of international communications; such an approach produces misleading and disappointing results.

Submitting telecommunications orders for international communications generally requires submitting separate orders to each of the suppliers. While the IRC may function as a coordinator, it cannot function as the ordering agent for PTT-provided services. The user must issue individual orders to the PTTs for the required in-country services. For certain PTTs, this requires a time-consuming process of administrative detail that greatly exceeds comparable U.S. carrier requirements. However, with the AT&T divestiture, this situation will become common in the U.S. and may no longer seem foreign.

Another difference between user expectation and experience is the availability or nonavailability of services. There is a tendency to assume that the telecommunications services available in the U.S. will automatically be made available in principal foreign locations. This is obviously not the case. In addition, foreign PTTs are generally less flexible in the interpretation of services and in permitting special modification of services than has been the U.S. experience. However, this restrictive attitude is gradually evolving toward one of more flexibility.

From our experience in working with clients with multinational needs, the two major areas of difficulty for such communications are defining information movement requirements and understanding available alternatives for international communications.

IN ESSENCE, PLANNING international communications should follow the same logical process as planning for domestic or local communications. The first step is to define carefully requirements for information movement independent of available means to satisfy these requirements. The definition should reflect needs as contrasted with technologically driven solutions.

The next step is to determine the available alternatives. This process is often the most frustrating, particularly for neophytes. Unfortunately, there is no single comprehensive source of information regarding international communications in the U.S. Often, some available sources may provide incomplete or conflicting information. Sources that may be used to help in defining alternatives are: IRCs, U.S. carriers with international interconnects, foreign PTTs, consulting firms knowledgeable about international communications and other companies with established international data communications capabilities.

Once the available alternatives are defined, the analysis of the alternatives is usually relatively straightforward. Particular attention needs to be paid toward cost, reliability, support and technical compatibility.

The most necessary, but most often neglected attribute is well-documented user procedures. Normally, the user will need to develop these procedures, because they simply are not available in a complete form from the various carriers involved.

How does a prospective user assimilate all of this to choose the IRC that best satisfies its needs? Unfortunately, the predominant method has been an ad-hoc process. Often, the selection is made without any form of meaningful comparison of available alternatives. A prevalent attitude has been that such a comparison does not make any difference.

The complexity and diversity of international communications demand a more rigorous approach toward carrier selection. The first step is a formal planning process, as outlined above, which results in a definition of requirements. The next step is the preparation of a written request for proposal. Even for relatively simple needs, selection of an international carrier should be based on vendors' formal, written responses to a statement of requirements. Examples of topics to be included in such a request include functional requirements, vendor support, maintenance, pricing and vendor range of services. They also include overseas representation, schedule requirements and customer reference.

In the future, the key theme for established IRCs and new international carriers is diversity of services. Competition for market share will be waged over attempts to provide a range of services that is most responsive to user needs.

International communications is evolving more rapidly than ever before. Advances in technology and the changing regulatory environment provide the driving force behind this change. Users need to plan and procure international data communications in a more formal, rigorous manner. ■

Mike Harrison, above, is group production editor, Computerworld Pty. Ltd., Australia. He submitted this anecdote about an electronic editing system.

It was all very pioneering stuff when a Sunday newspaper installed the first on-line editorial system in Sydney, Australia, a few years ago. It was a hybrid thing built round a Harris Corp. CPU with insolently dumb terminals.

There were bugs galore compounded by a team of software engineers and programmers who toiled night and day to adapt an essentially American system to Australian newspaper conditions. Crashes were common, and the only people who benefited were the proprietors of a nearby hostelry where frustrated journalists retired to soothe jangled nerves, while an equally frustrated DP staff got the system up again.

Memory is dimming, but I recall one day when we had only three hours uptime in a 10-hour shift. There was even talk in the pub of dusting off the old hot metal equipment to get the paper out.

Slowly things improved; crashes became fewer, and it became possible to get through to lunch without those awful bells ringing and the red lamps flashing. A big plus was when the dumb terminals were pensioned off for what was then a magic box — the Digital Equipment Corp. VT72 intelligent terminal. We sub-editors — a strange breed of journalist known as copy editors in the U.S. — were particularly enthralled with the headfit facility, which saved hours of cursing when trying to fit heads in a particular type font.

Then it all started again: crash after crash, lost stories, cold starts and beaming smiles on the faces of the pub proprietors. The problem took some time to track down. Among our typefaces was a pi font comprising all sorts of ornaments and symbols. In one software upgrade, a routine had been altered slightly, and the system hiccuped when asked to count a headline with a pi font in it.

The edict was swift and final — no more pi fonts in headlines. One morning, the system came down, and a furious systems manager was seen with axe and block demanding the head of the culprit who had put a pi font in a headline. There was an expectant buzz among the few who had not gone to the pub.

But the witch-hunt ended as quickly as it began. No head was served up on a silver platter, and the systems people were peculiarly taciturn and unforthcoming.

It took weeks for the truth to filter out. It seems that a very senior company manager who fancied himself a dab hand at the keyboard was giving some visiting VIPs a tour, which included an aside on the great pi font mystery. To demonstrate his point, he stopped at an idle terminal, called up the appropriate test file and keyed in the command for headfit. Command, execute, crash.

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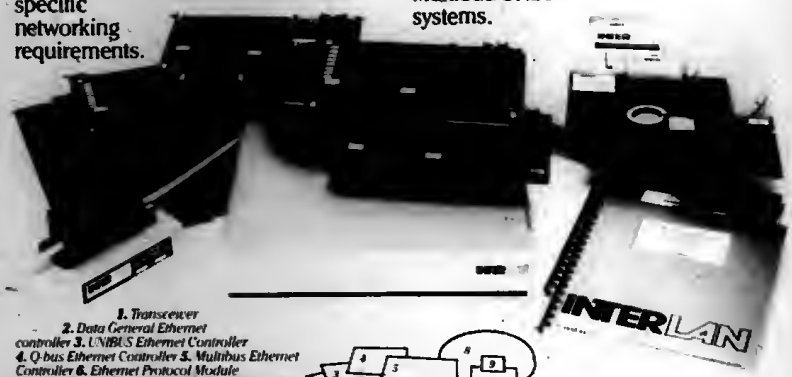

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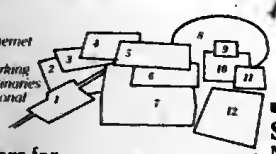

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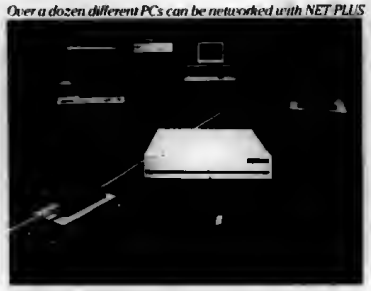

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